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JOURNAL OF A VOYAGE

IN

FIN'S BAY AND BARROW STRAITS,

IN THE YEARS 1850—1851,

PERFORMED BY

H. M. SHIPS "LADY FRANKLIN" AND "SOPHIA,"

UNDER THE COMMAND OF MR. WILLIAM PENNY,

IN SEARCH OF THE

CREWS OF H.M. SHIPS EREBUS AND TERROR:

WITH A NARRATIVE OF SLEDGE EXCURSIONS ON THE ICE OF WELLINGTON CHANNEL;

AND OBSERVATIONS ON THE NATURAL HISTORY AND PHYSICAL FEATURES OF THE COUNTRIES AND FROZEN SEAS VISITED.

BY PETER C. SUTHERLAND, M.D. M.R.C.S.E.

SURGEON TO THE EXPEDITION.

IN TWO VOLUMES.—VOL. I.

WITH MAPS, PLATES, AND WOOD-ENGRAVINGS.

LONDON:

LONGMAN, BROWN, GREEN, AND LONGMANS.

1852.

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and Simpson, by perilous journeys overland, we are chiefly indebted for what we know of the western half of the frigid zone, and their names will ever adorn the pages of Arctic history. But the return of both navigators and travellers still left the great and perplexing question unsolved.

As if Great Britain could not have sent out an expedition to each of the two poles of the earth at one and the same time, the north pole was again forgotten, while Sir James Clark Ross was engaged in a most interesting voyage in the Antarctic seas. The success of that voyage, and the safe return of the two ships the "Erebus" and "Terror" after surmounting dangers said to be unparalleled in the north, were hailed as the harbingers of equally decisive achievements, where the skill and intrepidity of the same navigator had to a certain extent been vainly exerted. Scarcely had the heat, received in the tropics, escaped from their huge timbers, thick doublings, and powerfully fortified bows, when they began to undergo all due preparation for service under the command of Sir John Franklin. Well fitted out in everything necessary for the voyage, provisioned for somewhat more than three years, and with crews, including men and officers, amounting

to one hundred and thirty-eight gallant and enterprizing fellows, they left our shores in May, 1845, and the last intelligence we had of them was dated in Baffin's Bay, two months after they had left the Thames.

As the third winter was passing by without any further intelligence of Sir John Franklin, anxiety began to be evinced at the Admiralty for his safety, and very soon thereafter the "Erebus" and "Terror" were first spoken of as "the missing ships," and "the missing expedition." In the following year (1848) three expeditions were set on foot, and despatched in three different directions,—Behring's Straits, the shores of Arctic America and Barrow Straits, the localities in which it appeared to be most probable they would be able to communicate with and assist, if necessary, the missing ships. These expeditions were commanded by persons of the most extensive experience, who had acquired almost the highest distinction as Arctic travellers, and, although in the course of their explorations much had been added to our knowledge of the regions they visited, the chief objects of their search were still absent from their anxious and, in some cases, mourning, relations, and no additional intelligence had been obtained. The return of the expe-

dition under the command of Sir James Clark Ross, from Barrow Straits, in the autumn of 1849, was as unexpected as it was unwelcome; and this was more especially the case from the fact that the "North Star," with a crew of, I believe, sixty-five persons, including seamen and officers, had been sent out with orders for that expedition to continue the search, and with means to enable it to do so with safety: indeed with perfect safety in the estimation of persons at home, who were totally ignorant of the ill health that prevailed in it. This ship, however, did not meet the expedition she was sent out to communicate with, and as she did not return that season, according to her own instructions, the Admiralty felt extreme anxiety for her safety, in addition to their daily increasing fears for Sir John Franklin's expedition, which was now passing its fifth winter unheard of among the ice.

After giving the subject the most ample consideration, such was the hope that the missing ships had penetrated to the westward in their attempts to win the long-contested prize, that it was at once resolved to send out to Behring's Straits, under the command of Captains Collinson and M'Clure, the ships "Enterprise" and "Investigator," which had just returned from Barrow Straits. Accordingly,

these ships set out early in 1850, and probably they arrived at the scene of their future researches in sufficient time to enter the ice that season. Having settled the question with reference to the possibility that Franklin's ships might appear at Behring's Straits, the next thing that pressed upon the attention of their lordships was the necessity that Barrow Straits should not be neglected, seeing that Sir J. Franklin might be retracing his steps eastward in boats, or even in the ships themselves, having given up the hope of making a north-west passage. With this sole object in view, four ships were placed in commission, under the command of Captain H. T. Austin, C. B., an officer of high distinction, who had served under Sir E. W. Parry, in a voyage to Port Bowen, Prince Regent's Inlet; and their ample equipment for Arctic service was making rapid progress in the beginning of March. An element, new, with the exception of one poor trial, in the navigation of ice-encumbered seas, was to be introduced: two of the above four vessels were to be screw steamers of sufficient power to advance in calm weather and smooth water at the rate of five or six miles an hour, with the two sailing vessels in tow. It was contemplated that this, the most extensive expedition that had

ever been engaged in similar service, should be ready to sail early in May. In the crew of each ship there were to be a few persons in the new capacity of ice-quarter-masters, who had gained some experience in Davis Straits while prosecuting the whale fishery as seamen. There were, however, to be no ice-masters, according to the custom followed in the former expeditions.

The Admiralty did not hesitate to consult such persons as might be able to afford advice or assistance, although they did not bear commissions under the seal of that honourable board. The Rev. Dr. Scoresby, at one time the commander of a whaler in the Greenland seas, and the author of standard and graphic descriptions of the regions visited by him during his career as a whaler, became early associated with the plans proposed for the discovery and the rescue of the missing ships; and, although his experience was chiefly applicable to the locality where it had been acquired, their lordships were not unfrequently indebted to him for suggestions of considerable practical utility, with reference to Davis Straits, and the most probable means by which they should succeed in carrying out their views in reply to the loud demands of humanity. Indeed, the time had gone by in which seeking for the lost was to

be confined to the Royal Navy of Great Britain. John Rae, Esq., surgeon in the Honourable Hudson Bay Company's service, who accompanied Sir John Richardson in his extensive explorations on the northern shores of America, and whose subsequent brilliant career as an Arctic traveller has been justly rewarded by the medal of the Royal Geographical Society, was in the service of the government on the outlook for any of the missing adventurers, in the event that even at this late period they should appear on the borders of the vast tracks already so familiar to Sir John Franklin in his perilous overland journeys.

The gallant Sir John Ross, C. B., &c., signally persistent in his endeavours to prevail upon the Admiralty to send him out in command of an expedition in search of his lost friend, having met with a deaf ear in that quarter, came before the public soliciting subscriptions. The result was so far successful, through the munificent liberality of the Honourable Hudson Bay Company, and, as the spring advanced, his small expedition assumed a state of active preparation for battling with the ice, and for a renewal of at least one or two of the scenes witnessed by its veteran commander during his

never-to-be-forgotten voyage to Boothia Felix in the little ship the "Victory."

Lady Franklin, and her most devoted companion, Miss Sophia Cracroft, the niece of Sir John Franklin, had laboured most incessantly in the good cause which lay so deep in their hearts; and, although indirectly, to their untiring exertions much that had been done in search of him whose long absence they still mourn was mainly owing. It was rumoured that at their own expense a vessel was to be fitted out for Prince Regent's Inlet, and ere long that rumour was substantiated by the purchase of the "Albert" ketch and her equipment for a voyage of discovery.

America received but one touching appeal, signed Jane Franklin, when Henry Grinnell, Esq., New York, stepped forward with unheard-of liberality, and two ships were fast preparing to follow up the search for her husband and our lost British seamen, and to engage in a service which (mirabile dictu!) the United States had never before attempted,—the discovery of a Northwest passage.

Previous to this time, however, these more than devoted ladies, faithfully representing, as they did, the sorrowing relatives of all in the missing ships,

directed their attention to another, and, I should say, not a less important, quarter. In the spring of 1849 they addressed themselves to the whalers, and explained to these adventurous and hardy voyagers, the different means through which, in the pursuit of their noble prey, they might assist in rendering signal service to the cause of Sir John Franklin. Their ardent expectations received a check on the return of the whalers in the autumn of that year, from the contradictory and, apparently, fallacious reports brought by some of them from the presumed scene of Franklin's labours. But they were not altogether disappointed; for attempts were made to communicate with Sir James Clark Ross's expedition; and although these were but attempts, still, such was the estimation in which they were held by the Admiralty, that the ships most prominently engaged in them received, as a reward, upwards of 1400*l.* of the public money. The "Advice" of Dundee, under the command of Mr. William Penny of Aberdeen, received, I believe, the largest share of that reward; nor did she perform the smallest share of the duty giving a title to it. An interesting account of her voyage was published soon after her return, by her medical officer, R. A. Goodsir, Esq., who accompanied Captain Penny, with the

expectation that he might have an opportunity of falling in with his missing brother Harry (as he familiarly calls him in the narrative), the assistant-surgeon of the "Erebus," and the naturalist of the Expedition.

The friends of Sir J. Franklin, contemplating a most vigorous search in every direction in which he might possibly appear, could not help observing that one, and not the least important, spot—the Wellington Channel—was still unprovided for; and, that it might stand high in public estimation, Jones's Sound, and probably also Smith's Sound, were early associated with it. Its deservedly popular name, however, soon rendered it popular upon its own merits; and the painfully intimate relation which it had to keep up, for a time, with the already-mentioned localities, across the bleak, and perhaps also cheerless, tracks of North Devon, was happily discontinued: it was still open for renewed negociations, in the event of a long and favourable stride being made by some stray but lucky whaler. This unoccupied field of research was daily exhibiting new attractions, and at length it was finally settled at head-quarters that an expedition should be equipped with a view to explore it.

From the fact that the "North Star" had not

appeared on the west side of Davis Straits, previous to the return of the whalers and of Sir James Clark Ross's Expedition, in the autumn of the preceding season, it was properly inferred that she had been caught among the ice on the opposite side, and detained there through the winter. And as a similar event had not befallen any of the whalers that had seen and been in company with that ship, the balance began to preponderate justly in favour of the skill and experience their commanders brought into daily use in navigating the ice-encumbered sea of Davis Straits and Baffin's Bay. Melville Bay, with its presiding *genii*, the Devil's Thumb and Cape York, all of a sudden assumed a most formidable character; and the opinion took deep root, that the whaler alone could convey the spell-bound ships across its tranquil waters.

There were competitors for the command of this new expedition; but the contest was at once decided in favour of Mr. Penny, the commander of the "Advice" of Dundee, whom I have already introduced. At the age of forty-one, having been engaged in the Arctic seas since entering his twelfth year, and in command of a whaling ship for sixteen years, vigorous and full of energy and zeal in the Franklin cause, no person seemed to be better adapted for the duty which he

had been wisely appointed to fulfil. Of his skill as a navigator, I have no pretensions to be a correct or a competent judge. Having accompanied him in two whaling voyages round Baffin's Bay, I am in a position to state, that his was almost invariably the leading ship in the whaling squadron, that his ship entered into the most minute detail of ice navigation, and that his ship was the last to leave Davis Straits, or whaling ground, when any hope whatever remained that such a course would advance the objects of the voyage: and I can also aver, that his brother commanders had every confidence in his opinion, no words being more familiar to me than "What does Penny think of it?" that, when his ship was in the "nip," the other ships were not advancing; and although, like other men, he sometimes took a wrong "lead," that no commander thought it in the least degree derogatory to come in after the "St. Andrew" of Aberdeen, which he then commanded. He made several voyages to other parts besides those visited by the intrepid whaler; and it may be stated no ship while under his command ever made any claim upon an insurance company. The venerable Hydrographer of the Admiralty, Admiral Sir Francis Beaufort, will bear testimony to the fact, that he had done something

in his whaling career to extend our geographical knowledge of the regions which he might legitimately visit in quest of his game, the whale. At no small risk, and at considerable expense, he took the first step to establish the interests of Great Britain on the west coast of Davis Straits, when, by extreme kindness, he induced an Esquimaux to visit this country, that information might be obtained with respect to the resources of that unexplored coast. This was the first Esquimaux from the British possessions within the Arctic circle that trod on British soil. He was attacked with a serious illness soon after arriving in this country, but careful nursing and assiduous medical attention brought about his recovery; and his benefactor fulfilled the solemn promise he had made to the uncivilised but affectionate mother of this home-sick adventurer, for Enoolooapike was restored to her, loaded with presents, after an absence of somewhat less than a year. An interesting account of the voyage in which this was performed, was written by Dr. M'Donald, the medical officer of the ship.

Captain Penny, however, failed in this and all his subsequent attempts to enlist the enterprising and the wealthy into his sound but not well-arranged ideas of establishing settlements on that coast, for

the very reason that a predominating feature in his character came between him and the end he had in view. His detailed descriptions are *sui generis.* A complicated net-work of valuable facts, fearlessly expressed opinions, most sanguine expectations, faithful inductions, and mere hypothesis, is what one may look for at his hands. Without rhetoric, and unsophisticated, his arguments fell to the ground before men whose lives had ever been closely associated with figures. No one need wonder that the sailor who had been buffeting the waves and the whales for thirty years, and had never calculated anything more intricate than a lunar distance, should fail to persuade a number of money-making merchants into forming a company. I beg to apologise to him and to the public for these remarks, but they are due to both.

There is no doubt it was a trying circumstance to the Lords Commissioners of the Admiralty, when they were called upon to appoint a person not holding a commission under the seal of their office to the command of two ships, the property of the government; and it was rendered all the more difficult and trying from the fact that there were many hearty and enterprising fellows yearning for Arctic service, who had been long under the red pendant,

and had acquitted themselves well when their services were required. The fear that proper discipline could not be kept up without the navy regulations during a long voyage occupied the attention of their Lordships for some time; and, from the questions which they put, it was very clear that, without those regulations, there was, in their estimation, hardly any guarantee for subordination. Viewing the matter in this light, it appeared to be an experiment fraught with danger, whichever way it terminated: if it should prove successful beyond expectation, the results no doubt would prove inimical to the strict rules of the government services; if, on the other hand, anything in the shape of insubordination should occur, the strict disciplinarians of the old school, those who abide by the law to the letter, would gain a triumph. This is probably going too far, although at the time the question and its doubtful results were carried much farther. It is very improbable indeed, that a private expedition, fitted out by the government for the express purpose of aiding in the cause of humanity, would in any way affect the regulations of the British navy.

After receiving directions from the Admiralty, Captain Penny repaired to Aberdeen and Dundee, where he purchased two new clipper-built vessels,

the one of two hundred and the other of one hundred tons, which he named after the devoted ladies whose names have already appeared. Both ships were equipped at Aberdeen, the "Sophia" having been towed round from Dundee as soon as she was launched. Her builder was Thomas Adams, Esq., and the builder of the "Lady Franklin" was Walter Hood, Esq. Captain Penny had the sole responsibility of the Expedition. He appointed to the command of the "Sophia" Mr. Alexander Stewart, a young man of promising talents, who was then serving in the capacity of mate of a whaler, and had made five voyages to Davis Straits. As third in command of the Expedition he appointed Mr. Manson, who had been upwards of forty years engaged in the Arctic seas, during thirty-four of which he commanded one vessel, well known as the "Superior" of Peterhead. The crews of both ships were appointed chiefly from among the whalers; there were, however, a few individuals who had not previously visited the Arctic seas. For their names, I beg to refer the reader to the Appendix.

Provisions for three years were to be taken in; and that portion of them which did not include "preserved meats" or "preserved vegetables" was under the immediate directions of the commander,

in addition to a thousand other duties; and to the experience which he had gained in conducting the curing of meat in salt, during the time that he was in command of whalers, the Expedition was indebted for the use of superior "corned" beef, which continued most excellent throughout the whole voyage.

Before the Admiralty Instructions, which are given here, arrived, the Expedition was ready for sea, and the Government Inspector reported favourably on the apparent efficiency of the ships for the contemplated service. As will be seen by a perusal of these Instructions, like all others issued for the guidance of persons engaged in Arctic service, they afforded an amount of latitude commensurate with the varying character of the seasons, and the peculiar changes that might be produced by unforeseen circumstances.

"INSTRUCTIONS to Mr. W. PENNY.

"By the Commissioners for executing the Office of Lord High Admiral of Great Britain and Ireland, &c. &c.

"1. Her Majesty's Government having determined that further endeavours shall be made to trace the progress of Her Majesty's ships 'Erebus' and 'Terror,' under the command of Sir John Franklin,

and to resume the search after that Expedition, and having resolved to employ you in the command of the two vessels, the 'Lady Franklin' and 'Sophia,' which have been equipped for that service, you are hereby required and directed, so soon as the said vessels shall be in all respects ready for sea, to proceed with them with all due despatch to Davis's Strait.

"2. In intrusting you with the above command, we do not deem it advisable to furnish you with minute instructions as to the course you are to pursue. In accepting your offer of service, regard has been had to your long experience in Arctic navigation, and to the attention you had evidently paid to the subject of the missing ships. We deem it expedient, rather, that you should be instructed in all the circumstances of the case, and that you should be left to the exercise of your own judgment and discretion in combining the most active and energetic search after Her Majesty's ships 'Erebus' and 'Terror' with a strict and careful regard to the safety of the ships and their crews under your charge, and with a fixed attention to that part of your orders which relate to your returning with those ships to this country.

"3. For this purpose you will be furnished with copies of the original instructions given to Sir John

Franklin, and which instructions will indicate the course he was directed to pursue, together with our orders and directions to Sir James Ross, when he was despatched on a search after Sir John Franklin, in the spring of 1848.

"4. You will be aware that the case virtually stands now as it did then; Sir James Ross, from adverse circumstances, failed in discovering traces of the missing Expedition.

"5. Our orders of the 9th May 1848 to Sir James Ross will still serve as the indication of our views of the general course you will have to pursue; but it being our desire that a certain strait known as Alderman Jones's Sound, and which would not appear to have been as yet examined, should be searched, you are hereby required and directed to proceed in the first instance to that sound, closely examining the shores for any traces of Sir John Franklin's course, and proceeding, should it offer the means of your doing so, in the direction of *Wellington Strait* and *on to the Parry Islands and Melville Island.*

"6. On your proceeding in the above direction, too much vigilance cannot be observed in your search along the various shores for traces of the missing Expedition. At the same time you will bear in

mind that Sir John Franklin's orders were 'to push on through Lancaster Sound, without stopping to examine any openings north or south of that sound, till he had reached Cape Walker;' and although it may be possible that the obstructions incident to navigation in those seas may have forced Sir John Franklin north or south of his prescribed course, yet that his principal object would be the gaining the latitude and longitude of Cape Walker.

"7. To that point, therefore, failing your discovering traces of the Expedition in your course by Jones's Sound and the Parry Islands, your efforts will be directed, and beyond this your own judgment must be your principal guide.

"8. The circumstance of Sir James Ross having partially searched the shores of Lancaster Sound and Barrow's Strait as far west as Cape Rennell without discovering traces of Sir John Franklin's ships has led in some quarters to the supposition of an extreme case; viz., that failing to get into Lancaster Sound, Sir John Franklin had proceeded in the direction of Smith's Sound, at the head of Baffin's Bay.

"9. We do not deem it expedient to direct your attention specially to this sound (or supposed sound); but should your passage by Jones's Sound, to which

you *are* specially directed, be early and absolutely impeded, and there should appear to you to be the time (without hazarding the only remaining chance of proceeding to Wellington Strait, the Parry Islands, and Cape Walker by Lancaster Sound,) for examining Smith's Sound, you are at liberty to do so; but this is a contingency scarcely to be contemplated, as, in the event of your being frustrated in the attempt to get to the westward and towards Wellington Strait by Jones's Sound, the late period of the year when Smith's Sound is said to be open would render it difficult, if not impossible, to combine a search in that quarter with the securing a passage into Lancaster Sound before the season closed.

"10. Much of the painful anxiety that now exists respecting the missing ships might possibly have been avoided if greater care had been taken to leave traces of their progress. You will consider it rigidly your duty, and a matter of the utmost importance, that every means should be adopted for marking your own track.

"For this purpose you will provide yourself with an ample supply of red and white lead for making paint; and, in addition to the usual pole or staff, or cairn of stones, usually looked for on a cape or headland, you will, wherever the colouring of the cliff or

shore admits of a mark being made in strong relief, paint a red or white cross, as the case may be, depositing as near to its base as possible, and at right angles with the perpendicular part of such cross, a bottle or other vessel containing a short summary of your proceedings up to the date of the deposit, an account of the state of your supplies and resources, the health of your party, and your further intended course.

"11. There remains but to caution you as to your return with your ships to this country.

"These ships have been provisioned and stored for three years; but you will bear in mind that this liberal supply is to meet contingencies separate on the one hand from the victualling of your own people, and, on the other, from a needless, reckless, and hazardous continuance in the Arctic regions.

"You have been victualled to supply the missing Expedition, or any part of it you may providentially discover; here is the one contingency; unforeseen impediments, or a certain prospect of coming up with any part of the missing Expedition, compelling you to pass a second winter in the ice, is the other; but our directions to you are, 1st, to use your utmost endeavours (consistent with the safety of the lives of those intrusted to your command) to succour in *this summer* the party under Sir John Franklin,

taking care to secure your winter quarters in good time; and, 2d, that the same active endeavours will be used by you in the ensuing summer of 1851 to secure the return of your own ships to this country.

"12. We refer you to the instructions contained in par. 21. of Sir John Franklin's orders, for your guidance in the event of one of your ships being disabled, or in case of any accident to yourself; and in par. 22. of the same orders are full instructions as to transmitting reports of your progress to our Secretary for our information; to both of which you will strictly attend.

"13. In conclusion, we have only to repeat the expressions of our confidence in your skill and in your known ardour in a generous cause; and we commend you and those with you to a good Providence, with our earnest wishes for your success.

"Given under our hands, this 11th April 1850.

"(Signed) F. T. BARING.

"J. H. D. DUNDAS.

"By Command of their Lordships,

"W. A. B. HAMILTON.

"Mr. William Penny,

"Ship 'Lady Franklin,'

in charge of an Expedition to the Arctic Seas, at Aberdeen."

After an absence of scarcely eighteen months, in the autumn of last year, the expeditions engaged in Lancaster Sound and the adjacent straits and inlets returned to this country with at least a clue to the route of the missing ships; and although the Lords Commissioners of the Admiralty could avail themselves of the log-books and journals kept during the voyage, and also of the reports drawn up by the commanders of the expeditions and the officers of the travelling parties, such was the difficulty in arriving at the detail that was necessary for their guidance with respect to their future operations in the same cause, that a committee to examine the officers of the expeditions was appointed, and the evidence as it was taken, assuming occasionally a controversial character, was laid before the public in not the most agreeable form, that of a *blue book*. However it was attended with good results in one sense, the search for the lost was not to be given up, and a faint ray of hope was rekindled, that Franklin or some of his gallant band might yet be seen. This hope *seems* to rest solely upon the supposition that he went through Wellington Channel.

An expedition of five ships, including two screw steamers under the command of Sir E. Belcher, C. B., was equipped and despatched for the regions

which the other expeditions had left occupied only by the "Albert," the small vessel purchased and fitted out at the expense of Lady Franklin. That most powerful expedition is now there engaged, and it is the earnest prayer of millions, that the reward due to the zealous labours of those that preceded it may not any longer be withheld.

Of the Expedition still engaged in Behring's Straits, little can be said here. It has been unheard of for some time, and there is room for anxiety respecting its safety; and if accounts of it are not received before that time, one may safely predict that an expedition will be sent out, early in December, with the view of rendering it some assistance, about this time next year.

Of boat expeditions conducted along the northern shores of North America much might be written that would prove highly interesting. In them Dr. Rae, Commander Pullen R. N., and Lieut. Hooper R. N. figure, with the greatest credit, as travellers, although, with respect to the chief object of their explorations, they have been altogether unsuccessful. It is difficult to account for the portions of dressed wood supposed to be part of the stanchion of a ship, and the fragments of rope containing the "middle yarn," being found, in lat. 68° 52′ and long. 103° 20′,

by Dr. Rae in his last journey. Considering the rapidity with which ice drifts about and may be conveyed to great distances where there is open water, it may be safe to refer these relics to other sources than the supposed wrecks of the missing ships. The "Fury," wrecked in Prince Regent's Inlet in 1825, disappeared in a few years, and who can tell but portions of her may not have been caught among drifting ice and carried northward out of the Inlet by a southerly gale into Barrow Straits, and thence westward, until ultimately they might be landed on the hitherto unexplored coasts northward of Coronation Gulf? Dr. Rae's opinion, clearly expressed at a meeting of the Royal Geographical Society, implied the extreme probability that there is a navigable channel leading northward into Barrow Straits from the strait discovered and examined by him in his last boat expedition. Presuming this to be the case, the pieces of wood, &c., in question, might have come from one of many sources, for example, the winter quarters of Sir J. Clark Ross's expedition at Leopold Island in 1848–9, of Sir J. Franklin at Beechey Island, of Sir Edward Parry at Melville Island in 1819–20, and of Sir John Ross from the years 1829 to 1833 in Prince Regent's Inlet.

Since the discoveries of Captain Penny in Wellington Channel and the regions beyond it were made public, much has been said, and not a little written, with respect to the resources of persons engaged in those regions independent of the stores they may have brought along with them. That deer are more abundant on the north side of Cornwallis Island adjacent to South or Maury Channel, than on the south side adjacent to Barrow Straits, no person need doubt; for Captain Penny and Mr. Goodsir's travelling reports contain frequent allusions to the numbers of these animals that were seen there, while not one, so far as I know, was ever seen during the whole year in any of the frequent excursions made from the ships in Assistance Bay. The inference to be drawn from this is, that the circumstances essential to their existence there are more favourable than where they are less numerous or nearly altogether absent. Temperature, speaking generally, is the beginning and end of these circumstances, especially if the geological formation be the same. And temperature in high latitudes as well as elsewhere depends much upon the presence or absence of extensive basins of water uninterrupted by land, where the ice will be free to drift about during winter. On this most important subject Sir John Richardson says,

at page 232. of Volume II. of his recent extensive work on Prince Rupert Land, "An examination of the several columns* will show clearly the effect of open water in Hudson and James's Bays, in tempering the atmosphere in the months of October, November, and December, and of the presence of ice in those seas, keeping down the summer heat:" and at page 257. of the same work is given + 4·54° as the annual mean temperature at Wolstenholme Sound, lat. 76° 34′, where H.M.S. North Star wintered. It is clear from these and the following observations, that not only does the sea render the summer less hot and the winter less cold, but that it also renders the annual mean temperature higher when occurring of greater extent, although in a much higher latitude. In the meteorological abstracts given in the Appendix at the end of the second volume it will be seen that the mean temperature at Fort Hope, although 600 miles farther south, is 1·2° colder than that at Wolstenholme Sound. Fort Hope, 488 miles south of Assistance Bay, is but 0·8° warmer; Sheriff Harbour, 280 miles south of the latter, is 0·1° colder; and winter quarters, Melville Island, in nearly the same

* Referring to Meteorological Tables.

latitude, is 1·1° colder. The ranges of temperature, however, are more extensive at the more southerly stations and at Melville Island than at Assistance Bay. Seeing that *open* water was found in Queen's Channel so early in the season as the 14th of May, it may be safely inferred that it was there throughout the whole winter; which will at once explain the reason why deer are abundant there, while they are altogether absent from other and less favoured localities. It will be rather peculiar if we find that these animals take towards the north side of Cornwallis Island as the winter approaches, that they may share the modifying effect which the open water in Queen's Channel must have upon the atmosphere in its vicinity; and it will appear at variance with the generally received opinion that these animals migrate southward on the approach of winter.

The observations made in the Wellington Channel and farther northward, indicative of greater cold there than at the ships in Assistance Bay, do not afford a proper or a just criterion, for the reason that they were made after the land had been exposed to the influence of the sun for three months and a half; and as land conducts heat much more rapidly than ice or water, the thermometer indicates the change considerably earlier. When Captain Penny

entered the water in the south channel with the boat about the middle of June, the winds began to prevail north-west; and this may be taken as a tolerably sure indication of the continuation of water westward and northward of the distant strait which bears his name, and by the continuation of which he at present appears to stand. In the highest latitudes visited by our travelling parties, snow began to melt on the land about the 7th or 8th of June; and before the middle of that month there was abundance of running water, and the temperature was considerably above the freezing point. The result was, that the land became warmer on its surface than the ice-encumbered sea of Victoria Channel, &c., and the wind, following the well-known law, prevailed in the direction of the heated surface.

In the event of Penny's Strait extending far to the westward, which appears highly probable, it is an important question, Which time is the most suitable for navigating it? Ships are not permitted access into it till the end of the season, and then the winds are generally violent and the weather stormy. Were it possible to get into it, there can be no doubt that, like all other parts where the ice does not close up during winter, the best time for navigation is

early in the season. In addition to what is said on this subject in the narrative, it may be proper to allude here to the experience of Captain, now the Rev. Dr. Scoresby, on the coast of East Greenland. That distinguished observer says; "The currents upon the eastern coast of Greenland require a few remarks, The main current here, as in the Greenland and Spitzbergen seas, sets to the South-westward; but there is a peculiarity along the coast of great importance to the navigator. This is a periodical offset and inset; the latter apparently occasioned by the action of the great inlets that intersect the coast in such various positions. It would appear that there is an offset from the coast in the months of June and July, produced probably by the quantity of water poured into the sea on the melting of the snow on the land: this offset, aided perhaps by north-west winds, which, in opposition to the general indraught of the sounds and inlets, clears the bays and coast, so as to afford access to the navigator in the height of summer. But as soon as the discharge of water from the mountains ceases, this offset appears also to cease, and an inset then takes place, which chokes up the bays and sounds with ice, and packs the whole of the body floating to the eastward in close contact upon the shore. The indraught which takes place at the close

of the summer, as far as regards the present season, has been sufficiently proved; and the offset, or at least a suspension of the inset, is rendered equally certain, by the progressive separation observed to take place in the ice, and more especially by the vein of clear water found in many places between the coast and the ice. The inset that occurs in the end of summer renders the west land fishing not a little dangerous at this season: of this tendency the fisher should be always on his guard."* This reminds me of what Mr. Petersen mentioned to me on one occasion, that at Leively, and all along the coast of West Greenland, they look for the approach of the "west ice" every season in the month of October or November.

In viewing the route proposed by A. Petermann, Esq. F.R.G.S., for sending relief to the missing ships, one cannot help being struck with the practical basis on which, in part, at least, he founds his plan,—namely, to set out early in the season before the ice is reduced to a state of pack and southerly winds begin to prevail, when ships can be navigated in the "clear vein" of water alluded to above.

Besides the mere presence of extensive seas within

* Journal of a Voyage made in the Summer of 1822 by W. Scoresby, jun. Edinburgh, 1823.

the Arctic circle tending to modify the climate, and to render it less unsuitable to the existence of terrestrial animals, the northerly currents from warmer latitudes, which are essential in maintaining the mean salinity of the ocean every where, produce a very remarkable change, so that it is by no means unfrequent to find the temperature higher instead of lower in high northern positions. The observations of Sir Edward Parry at and beyond Spitzbergen, and of Captain Beechey in Behring's Straits, of which a short abstract will be found in the Appendix, and our own observations in crossing the Atlantic, all point this out very clearly. But a paper "On the Causes of Change in the Earth's Superficial Temperature," recently read before the Geological Society by the President, William Hopkins, Esq., and subsequently published in Part I., February, 1852, of the Quarterly Journal of that Society, shows in the clearest manner the powerful influence which the Gulf stream has in raising the temperature of the north of Europe.

The subject of climate (or I should rather say meteorology)—equally interesting to the physical geographer, the geologist, and the naturalist, in whose domain it works marvellous changes; as it is important to the merchant, whose goods are con-

veyed across the vast oceans of our planet; and to the physician, who can neither understand nor counteract its subtle and frequently pernicious influence upon the human race — has hitherto been treated with too much indifference by travellers generally to enable those deeply interested in it to arrive at correct inductions. It is to be hoped, however, that the example of Sir John Richardson, Sir Edward Parry, Sir James Clark Ross, Rear-Admiral Sir John Ross, Captain Beechey, and others, and the zeal of Professor Dove of Berlin, Lieut. M. F. Maan of the United States National Observatory, James Glaisher, Esq., F.R.S. &c., of the Royal Observatory, Greenwich, Lieut.-Col. Sabine, Mr. Petermann, F.R.G.S., and Mr. Hopkins, under the patriarchal guidance of Humboldt, will enlist into the study of this department of science the observing abroad and the learned at home. In entering into such meteorological detail in the Appendix, it is probable that I have exposed myself to criticism, and perhaps also to censure: the importance of the subject is the only apology I have to offer to those who are taken up with other, and perhaps not less important, pursuits.

In laying before the public an account of the

voyage in which I was engaged, I have to express deep regret that it should have swelled out to such huge dimensions. After the return of the Expedition, the deep and growing interest taken by the public in the search for the missing ships, the readiness and avidity with which every thing "Arctic" was printed and read, and the large share of attention devoted by that learned body the Royal Geographical Society to the thorough exploration of the Frigid Zone, as well as to the cause of humanity, appeared to be a sufficient guarantee that there was really need for such a work as should convey a detail of the proceedings of the ships during the whole voyage. It was not without numerous requests, and considerable reluctance, that I felt constrained to put my rough notes into some sort of arrangement for publication; nor was it without first endeavouring to prevail upon my friend Mr. Goodsir to undertake a duty which he owed to the public, and was entitled to himself, from the fact that he had been already favourably received as an author. It was fully his intention at one time to have done so; but duties connected with his profession pressed so much upon his time, that he relinquished the idea that he should be able to accomplish it. Thus it devolved upon me; and, however clear my anticipations may have been

of severe criticisms, I dared not shrink from as correct a rehearsal as possible of all that came under my own observation, and the observations of others who might have had better opportunities; and I hope the fact that it was due to the promoters of the Expedition, and to all engaged in it, that nothing appearing likely to interest in the slightest degree ought to be omitted, will to some extent disarm those who may see just cause for censure. If the perusal of these volumes legitimately rekindles new hopes of the return of even a few of those whom we sought in vain; if it throws any new light upon the great actions which pervade the vast kingdoms of nature; or if it conveys the conviction to the impartial reader that, to navigate ice-encumbered seas with safety, experience is absolutely necessary, I will not consider that they have been written altogether in vain.

Before concluding these remarks, I beg to repeat my expressions of gratitude to Captains Penny and Stewart, and my brother officers, for their cordial and steady friendship; to Mr. Petersen, to whom the Expedition and the British Government are deeply indebted, I beg to return my most sincere thanks; and for the assistance I have received from persons of eminence in various departments of science, some of whom have kindly contributed to the Ap-

pendix, I owe a debt which I can never repay. In conclusion, I beg to acknowledge the services of the artists employed upon the illustrations; and I doubt not the public will appreciate the arrangement and skill of the lady who has, from the dried specimens, presented them with a plate, exhibiting the most abundant species of the thinly-scattered flora of Cornwallis Island.

London, July, 1852.

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VOYAGE IN SEARCH

OF

SIR JOHN FRANKLIN.

CHAPTER I.

PASSAGE ACROSS THE ATLANTIC.

Expedition leaves Aberdeen.—In Sinclair's Bay.—Passage through the Pentland Frith.—Lose sight of Land.—Course proper for a speedy Passage.—Rockall seen.—Final Departure from Rockall.—Rapid Progress westward.—Fulmar Petrels, and their Food.—Looms and Little Auks.—Gulf Stream and Arctic Currents.—The Rorqual Whale, its Habits, Baleen, and Oil.—Division of the Crew into Watches.—Sea-Sickness.—Sailing Capabilities of the Ships.—Perceptible Drift southward.—Sea-Fowl off Cape Farewell.—First Icebergs seen.—Great Dangers to be encountered.—Church Services on Sundays, and their Benefit to the Crew.—Land Birds seen, and alighting on Board.—Land seen.

THE "Lady Franklin" and "Sophia" were towed out of Aberdeen Harbour, in the presence of immense crowds of well-wishing spectators, on the afternoon of the 13th of April, 1850; and after all the arrangements relating to the Expedition had been made,

which occupied the greatest part of the evening, we shaped our course to the northward along the land, and soon began to observe Buchanness Light, which could be distinguished easily by its intermissions of five seconds. The wind continued to favour us during the night; and on the following day, Sunday, April 14th, there was a smart breeze, which long before mid-day took us out of sight of Aberdeenshire, and before night-fall we were close in with Noss Head on the Caithness coast; but, although the wind was still most favourable, we were under the necessity of waiting, until the then easterly-going tide should change to the westward, and afford us an easy, speedy, and safe passage through the Pentland Frith. We here parted company with Mr. Hogarth, who had kindly accompanied us, being on one of his numerous visits, in his yacht, to his extensive fisheries on the north and western coasts of Scotland.* The night was very dark, for the sky was completely overcast with dense blue and drifting clouds, the wind was hourly increasing in violence from S. E.; and as the sea began to be very "cross," which made the ships toss about, to the constant annoyance of not a few ill-

* I beg to take this opportunity to acknowledge the extreme kindness and invaluable assistance which we experienced at this gentleman's hands, while the Expedition was fitting out at Aberdeen.

secured articles in our cabins, we were very glad of the shelter which Sinclair's Bay afforded, as we ran into it by the assistance of a beautiful light, which had been but recently erected on Noss Head.

April 15th.—At a very early hour the tide began to favour us, and long before our usual breakfast hour (eight o'clock in the morning) the "Old Man of Hoy," and Dunnet Head, were dropping fast astern. In the evening, we were off Cape Wrath, where it was thought proper to telegraph "the Expedition;" and at eight o'clock at night, the departure was taken from the Butt of Lewis, which is in lat. 58° 32′ N., and long. 6° 22′ W.; and each of us had to say farewell to his native shores for a time.

During the early part of the day, the wind blew violently from about east, accompanied by a good deal of rain, but towards noon it moderated a little, and veered a point or two to the southward; the rain also ceased, and the beautiful blue sky began to open out; and as our first night on the bosom of the Atlantic approached and closed in around us on the deep blue sea, our prospects were rendered all the more cheering, by the opening clouds settling to the horizon, with stars peeping pleasantly from the blue sky beyond, the keen bracing atmosphere, and the most abundant signs of favourable weather.

The course, pursued by whalers and other ships,

on their passage to Davis Strait, is generally about due west; but it varies according to the season of the year, it being generally necessary to keep well to the northward in spring, to take advantage of the strong northerly gales experienced when Cape Farewell is approached; again, about the end of summer, it is very advisable to keep well to the southward, for fear of being driven too far to the northward by the south-westerly winds, which then begin to prevail over the North Atlantic Ocean. The varying rapidity of the gulf stream and Arctic current, with the period of the year, also requires a due share of attention from the Arctic navigator; and allowances must be made, so as to avoid making the passage longer than it really is. Independent of all these important circumstances, which ought never to be lost sight of, he will discover the wisdom of not keeping his ship in the teeth of a foul wind; for it has been proved again and again, that the readiest and safest mode of getting out of a foul wind, is to keep the sails "clean full," which it is obvious will carry the ship across and out of its track; it being understood that this can be had recourse to only in abundance of "sea-room," and where there may be no danger of getting too near the land.

April 17th.—While taking the meridian altitude, Rockall, in lat. 57° 36′ N., and long. 13° 39′ W.,

was observed bearing about south at a distance of twelve miles; and from its resemblance at that distance and bearing to a ship under sail, an idea obtained that it was not what it subsequently proved to be. It is not seen very frequently, considering the number of ships whose track to Davis Strait lies so near it: one of our officers, who had crossed the Atlantic to Davis Strait at least sixty times, said he never saw it but once; acknowledging, at the same time, that it was very probable it might have been seen more frequently, but had not attracted attention, in consequence of being taken for a ship.

At the distance we were from it, sea-fowl could not be distinguished; however, from its favourable position, in the neighbourhood of a fertile fishing bank, we had no doubt of its being well peopled with feathered inhabitants, which could pass their time in safety and prosperity, and would afford a rich harvest to persons who might possess the intrepidity to visit it every season to collect feathers and down. A second departure was obtained, and, as the wind continued to favour us very much, Rockall was soon lost sight of far behind, and our snug little vessels were hastening on to the land of ice and snow.

April 21*st, Sunday.*—I could not but remark the extremely rapid progress we had made. Up to this time the wind had prevailed from the eastward, and

proved most favourable to us: degrees of longitude were ran down at the rate of three or four in a day; and although the sea was sometimes very rough and stormy, and its foaming waves raged and roared angrily around us, and appeared disposed to threaten our safety, like true "blue jackets" we feared nothing, and cared not, so long as the wind continued fair, and we could hold canvass to it. During the four preceding days the sky was generally overcast and cloudy, if not also hazy, so that observations could not be obtained. The latitude and longitude, however, by "dead" reckoning, were 58° 16′ N., and 25° 38′ W.

Fulmar petrels (*Procellaria glacialis*) were our unwearying attendants; three or four, and sometimes even a dozen or more could be seen skimming over the crests of the angry and foaming waves in our wake and around us; they appeared to dip their strong bills in the water, as if in the act of picking up something, but they very rarely alighted, especially in stormy weather. I frequently endeavoured to ascertain, what they could possibly find to repay such indefatigable assiduity, in what to me appeared to be such ill-requited toil, and to enable them to remain so long and at so great a distance from land; but I could never detect anything between their strong mandibles, nor did frequent examinations of the sea-

water with the naked eye enable me to discover what could possibly be their food. There can be no doubt the sea-water must contain animal forms upon which these and other birds, so often seen at a great distance from land in the Atlantic, feed; indeed, I consider this well proved by the luminous appearance it assumes when agitated, as in a storm, or even in a vessel in the dark; and I think it highly probable that the Fulmar scans the surface of the wide and boundless ocean for its food, which is rendered an easy prey in the miniature whirlpools and eddies in a ship's wake, and in the hollows of the rolling waves during a storm. The great strength and form of the bill, as well as what is known of the habits of the fulmar petrel, lead to the idea that its food consists entirely of animal tissues of the highest development. I have seen the Fulmar in thousands attacking the "krang" or carcase of the Greenland whale, and its predilection for the oily tissue and stinking flesh of that huge animal is quite familiar to me; but still I think the above opinion may be safely advanced, since it is based upon the oft-repeated observations of many individuals.

Loons (*Uria Troile*), and little auks (*Alca Alle*) were frequently passed in considerable numbers, although our distance from Iceland, the nearest land, was not less than three hundred miles, while we

were upwards of six hundred from our own shores, and eleven hundred from Cape Farewell and Greenland. They must have allowed themselves to be drifted to the southward by the prevailing northerly winds during the winter and spring months into a more genial climate, and, now that summer was approaching, they were again migrating to their old habitats. It occurred to me that their instinct would lead them into the track of the great gulf stream, which would enable them to get within the Arctic Circle without the aid of flight; for on account of the shortness of their wings and their great proportional weight, they are ill adapted to accomplish great distances. This idea requires to be confirmed by subsequent observations, although my experience, little as it may be, fully bears me out in it. Early in the season in Davis Strait, the little auk and the loon may be seen in myriads in the track of the current which sweeps from Cape Farewell to the northward along the eastern shore of the Strait; but, as it advances, and their young are fit for removal into the water, they betake themselves to the middle of the Strait, when, doubtless, the southerly-going current assists to carry them in that direction. If this happens every season in Davis Strait, there seems to me no reason why exactly the same should not occur in the North

Atlantic Ocean, for it too possesses its northerly and southerly-going currents. The gulf stream, having traversed it obliquely, sweeps to the N.E., between Iceland and Norway, until it reaches the south-eastern point of Spitzbergen; at the western point of which the great Arctic current begins, and moves steadily to the southward between Iceland and East Greenland, and along the uninhabited and unvisited shores of the latter, until its chilly waters mix with or pass underneath the edge of the gulf stream off the island of Newfoundland, where the deposition of the well-known banks is the result. Now, it is obvious that birds, by shifting their position east or west even one hundred miles, will get into one of these currents, and be carried irresistibly north or south as the case may be, without that amount of exertion which, under other circumstances, would be necessary before such a decided change of position could be effected. It is very probable also that their food depends entirely upon these changes, which instinct will enable them easily to accomplish.

A large rorqual whale (*Rorqualis borealis*) was seen following the ship, now shooting a-head, crossing the bow, now dropping astern, and lost sight of for a time, and again coming up, with the fin exposed, at intervals of ten to twenty minutes, and passing us with as much apparent ease as if the ship had been

actually standing still; whereas, she was making good at least eight miles an hour. The whalers hardly ever succeed in capturing this huge animal: hence they rarely attack it. From its acuteness and velocity in the water, it baffles all their stratagems and dexterity. Its food consists chiefly of fish, of not very large size, I should suppose, from the closeness of the lamellæ of whalebone, which, by being hairy on the inner side, serve no other purpose than simply to strain its food when received into its capacious mouth.

The baleen of the rorqual varies in length from four to twenty-two inches, and very rarely attains two feet, the average length being about fourteen inches in an ordinary sized individual. Each plate is of a triangular form, and as the structure appears to consist chiefly of parallel fibres resembling coarse hair, cemented closely together, of which those of the outer edge are the longest, it is obvious that those of the inner edge vary in length from the extremity or point to the base or attached part, and expose their ruffled extremities, in the form of coarse black hair, to whatever is brought into contact with them.

From the extreme rapidity of this giant of the deep, one would be apt to expect to meet it in all parts of the North Atlantic, without at the same

time associating with this fact the idea of great numbers; and so it is, for it is to be seen on passages to America, Davis Strait, Greenland, and on the British coasts; but it never occurs in "schools" like most of the cetacea. I never saw above two at one time, and generally only one. The empire of this whale seems to be the wide sea from shore to shore; now engulphing thousands of herrings on our own coasts, and proving highly destructive to the poor fisherman's nets; while, at other times, it is said to carry devastation into whole shoals of salmon, in the entrance of some of the rivers and harbours, and along the coast of Iceland; now deigning to touch upon the Greenland coast, it enters Davis Strait, and commits fearful havoc upon the fertile cod-fishing banks there. Its caprice seems to know no bounds, for it requires new ground, long before its resources on the old can possibly be exhausted,—surely, even with all the voracity of its huge mouth and capacious stomach, in a few days, and in the midst of such great abundance, it cannot be starved out. The habits of the rorqual are so much at variance with the habits of the proper baleen whale, that they have never been known to associate, except when circumstances compel them to appear on the same ground. Like the rest of the cetacea, the rorqual whale has the cellular tissue, immediately beneath

the well-known epidermis, well filled with oily matter, which varies in thickness from four to eight or ten inches, and yields an oil which becomes solid at ordinary temperatures in the winter months in Britain. This is owing to a large preponderance of the solid constituents of animal oils, such as margarine and stearine, which ought to attract the attention of the soap manufacturer, and bring a fair price in the market. From the shortness and lightness of its baleen, and from not yielding above sixteen tons of oil, even in a large individual, this whale will never vie with the real baleen whale; but if its capture can be rendered as easy and safe as that of the other, I have no doubt a fair profit will arise to all parties who may engage in this noble sport.

April 22nd. — The weather still continued stormy, and there was much rain, but the wind was from about S. E., which suited us very well. The crew of each ship was divided into two "watches," the number of men being too small to allow of three, as is generally done in the whalers. When the weather happened to be stormy, no work could be conducted, except such as might be absolutely necessary for the sailing and safety of the ship; and those who had to be exposed to it, especially if there were rains, had strict orders to protect themselves, by using their

oil-cloth jackets and trousers, of which they appeared to possess a good supply. Sea-sickness had been long over with all of us; but if any person then happened to be affected, it was very slight, and generally disappeared after a day or two, or perhaps even by going into the open air and remaining there for a short time. Sea-sickness is sometimes remarkably obstinate; or there is such a peculiarity of constitution that neither time nor violence of storms removes the aptness there is for this disease. I have often observed that dried fish, especially smoke-dried, allayed the violent retchings, when even brandy and every thing that could be taken were not allowed to remain five minutes in the stomach. It is very probable that this depends upon the creasotic principle which the fish receives in the process of drying.

By this time we were able to judge of the sailing capabilities of our ships. The "Lady Franklin" could sail at least one mile in the hour faster than the "Sophia," when going at the rate of nine or ten miles an hour, if the sea happened to be rough, which it generally is in the Atlantic, with strong winds. I must acknowledge that the idea "that we had to be waited for" was by no means comfortable to us in the "Sophia," when we were really doing our best, and her good spars were bending like reeds before the violence of the gale. The "Lady Franklin" always

appeared to roll and pitch very heavily, and to take a good deal more sea on board than the "Sophia;" this was owing to her having to go under easier sail, waiting for us coming up under a perfect press of sail, indeed as much as could be carried with safety. In her hull, in the symmetry of her rigging, and ropes, in the exact proportion of her masts and their rake, and in the beauty of her white widely-spread but neatly-cut and well-set sails, the "Lady Franklin" was certainly an object of great beauty and attraction, and, if possible, worthy of the mission on which she was sent. Hurrying on as if borne along on angels' wings, she deigns to wait for the "Sophia," as if the latter were actually requiring encouragement, to follow up in her work of humanity and love.

The monotony of our passage across the Atlantic was very much broken by keeping company; and when the weather permitted it, the ships approached so closely, that interrupted conversations could be carried on from time to time without the use of speaking-trumpets. Observations were obtained at noon and in the evening, and the latitude and longitude were found to be 57° 48′ N. and 30° 21′ W.

April 26th. — It must be acknowledged that our passage hitherto was remarkably quick, this being but our thirteenth day from Aberdeen, while we

were crossing the fiftieth degree of west longitude in latitude 59° 45′ N. During the three preceding days it was found that the ship was making twelve miles of southerly drift every twenty-four hours, which could be accounted for only by the supposition that we were in the track of the Arctic current. For example, with favourable easterly winds a course was shaped at noon for a point marked upon the chart, which we might reasonably expect to reach on the following day. The utmost care was observed in steering the ship, and the compasses were changed and corrected; but day after day the results were the same, and we were invariably ten or twelve miles to the southward of our reckoning. Flocks of "cape hens" (*Procellaria Puffinus*), and occasionally the little puffin (*Alca arctica*), known to seamen by the names "sea parrot" and "tammy nory," were seen every day, in addition to abundance of loons, fulmar petrels, and kittiwakes (*Larus Rissa*). The presence of so many birds afforded a good proof that we were approaching Davis Strait, if not already in its entrance.

Those of the crew who had not before visited the Arctic seas could not keep their straining eyes from the distant horizon. They expected to see something really wonderful in an iceberg from the descriptions they had seen and heard; but, instead of floating

worlds, as their vivid fancies had so often pictured, I could imagine their disappointment on having pointed out to them as icebergs (which they really were) two masses which did not appear to be more than forty feet above the surface of the water. These icebergs were first seen in the afternoon about four o'clock; and, as night approached, and the wind carried us up the Strait, the orders "to keep a good look-out ahead" for fear of running foul of any that might lie in our track, were reiterated. The common seamen on board the whalers are all deeply impressed with the importance of the duty they have to discharge in dark and stormy nights in the entrance into Davis Strait, when they pass their anxious "watches" peering through the driving snow, groping about the slippery decks, or perched upon the lower or topsail yard of the foremast.

The narrow escapes, the encounters, and serious disasters of ships with icebergs are so well known, and so fully described, that even an inexperienced person can readily conceive the appalling dangers which one may expect to meet in the early part of the season in these seas. With all our careful surveys, correct bearings, well-projected charts, and beautiful lighthouses which illuminate the promontories, and mark out the positions of dangerous rocks and shoals on the British coasts, shipwreck

attended with considerable loss of life is of every-day occurrence. From Cape Farewell to Disco Island, extending to a distance of thirty to forty miles to the westward of West Greenland, where it meets the drifting "pack," there is, in the month of April, a space of water, generally free from "pack ice," equal in extent to 15,000 square miles. This space the intrepid navigator must enter, and abide by in pursuit of his noble prey, defying equally thousands of floating ice-islands, whose positions are ever changing, dark nights, and storms of terrific violence, and with impunity too, without survey or chart, light or bearing,—in short without everything but his own dear-bought experience, which in such a place is indispensable. Captain Penny related to me an adventure which occurred on board the "Neptune" whaler of Aberdeen under his command, while on the homeward passage, with a valuable cargo of oil and whalebone, about this part of Davis Strait. It was a dark, snowy, and stormy night in October, the sea was running high, and there was so much wind that only double-reefed sails could be shown, under which the ship was going about two "points" free, and at the rate of perhaps four miles an hour. A few icebergs were seen in the fore part of the day and passed, but as evening and night approached, and none had been seen for a few hours, the idea obtained

that they had got through the "thick" of them. After passing a great part of the night on deck looking out, the captain went down into his cabin for a few minutes, when faithful Peter Murray, chief officer of the "watch" as well as mate of the ship, hailed him in a stentorian but mournful bawl, "We are on the face of an iceberg, sir;" meaning that they were so near, as to render escape impossible. As may be supposed, he sprung to the deck with the quickness of thought, and was at the post of danger in an instant. The yards were braced up, and the ship sailed close to the wind, with some of the sails shaking and flapping uselessly, while the sea spray, from the towering cliffs of the iceberg, was falling in showers upon the deck, and every sound of human voice was completely drowned in the deafening roar of the waves dashing mercilessly against its hard and rugged sides. The "Neptune" was by no means a fast-sailing ship; consequently, hauling close to the wind stopped her way very much, and, from the great dimensions of the iceberg, it was very doubtful for some time whether she was to go clear of it; awful suspense! At length the furthest extremity of it was observed, and the ship's bow was opposite to and soon past it: but now was the critical moment, for the eddy-wind and waves assisted no longer to keep them apart; it was evident even in the extreme darkness of the

night, and enveloped in the seething foam, that they were about to close. At length the main chains of the ship were opposite the corner of the berg, but not far from it; the main-braces were hauled in, and the yards squared, and the helm was put "hard up" and firmly secured; while the helmsman was peremptorily ordered to quit it, and the quarter-deck to be instantly forsaken: a few seconds more, and the stern was clear, but so near that the mizen-boom, which projected eight or ten feet beyond it, struck, and sustained some damage. The escape was almost miraculous; but it must be allowed, that although all the rest had escaped, one life might have been lost by the boom breaking, or being knocked out of its place, had it not been for the presence of mind of the commander, by whose order the helmsman had to quit his post when the catastrophe was about to happen.

Had any part of the ship's hull or yards struck the weather side of the iceberg but once, the second stroke would have been the finishing one. Wild and callous as the hardy sailor inured to dangers from his earliest boyhood, may appear in the eyes of the mild and amiable on shore, there was not an individual in that ship whose grateful feelings did not ascend to Him by whom they had been saved in that perilous hour.

April 28th, Sunday.—During the two preceding days, the weather was very stormy, but now it began to moderate, and the wind shifted from S.W. to S. E.; the sea, before rough and boisterous, was now assuming a more tranquil aspect, and the deep and heavy "ground swell," peculiar to the Atlantic, was arrested by small streams of ice to the southward, which we occasionally had to pass close to, on our passage up the Strait. In consequence of not having come to some arrangement about the Church Services, the two Sundays, since we had left Aberdeen, were allowed to pass, without attending to that most important duty. As it was fully understood before sailing, that the Book of Common Prayer should be in use in our Expedition, fifty copies were obtained and distributed among the crews of the two ships. At eleven o'clock all hands assembled on the quarter-deck; each had on his best clothes, and the strictest attention had been paid to cleanliness. The beautiful morning service of the Church of England was commenced and gone through, while there was not one present, whose conduct deviated from the devotional feeling that seemed to pervade the whole; each seemed to go away, when it was over, with a feeling of satisfaction in himself which no other duty, however faithfully discharged, could possibly produce. Much good might be anticipated from the practice

which was about to be commenced; — a practice which cements men and officers to one another, and all to their commander; and cannot fail to assist effectively in keeping up subordination on board ship, proving a wholesome check upon tyranny and disobedience, while it cultivates a brotherly feeling, such as one would find among persons involved in deep distress, who participate in each other's sufferings. I am convinced that, if commanders of ships would but devote themselves and their spare energies, in real earnest, to the best interests of their crews, the odium which is occasionally associated with the character of seamen would be removed, and their relaxed habits exchanged for better modes of living.

As the sky cleared up at noon, a meridian altitude was obtained which gave the latitude 62° 43′, but in the evening it again became overcast, which prevented observation for longitude; however, by dead reckoning it was 53° 57′. The barometer, which had begun to ascend, when the wind first veered to the eastward, continued to do so, while the latter increased in violence, and appeared disposed to cling to that quarter.

April 29th. — Great numbers of towering icebergs were seen and passed as we proceeded to the northward, but very little drifting ice. The wind favoured us exceedingly, although at times it was very squally,

and accompanied by dense showers of flaky snow. In one of the squalls several snow-buntings (*Emberiza nivalis*) were seen; some of them succeeded in alighting on the ship, while the others were blown to leeward, and lost sight of among the driving snow. One of them was found dead upon the deck: the poor thing had likely died from fatigue and hunger —most probably the latter, for its gizzard contained nothing but a few particles of grit, which would yield but little nourishment to its weary limbs in the face of the pitiless storm. The sun appeared at times, and enabled us to ascertain the latitude, which was 64° 48′, about the parallel of Fiske Fiorde, and the longitude being about 54°; in the evening we saw the bold and rugged land of West Greenland.

CHAP. II.

PASSAGE FROM REEFKOLL TO NORTH-EAST BAY.

Severe Gale on the Arctic Circle. — Icebergs numerous. — Depth of Water on Reefkoll Bank. — Supposed to be a Deposition from Icebergs. — Cod-fishing. — The Food of the Cod and Halibut. — Food of the White Whale. — Approach the Pack Ice. — Extensive open Water, and its Causes. — Reasons for attempting a Passage to the northward early in the Season. — Arrival at Leively. — Landing with Letters. — Disco Island. — Its volcanic Origin. — Hare Island. — Fauna and Flora of Disco. — Deer abundant. — In North-east Bay. — The Difficulties experienced in navigating it. — Marine Animals. — Seals. — Among the Whalers. — First Saturday Night beset in the Ice.

April 30th. — As we were crossing the Arctic Circle, we experienced a very severe gale, which forced us to "heave to," owing to the immense numbers of icebergs that lay in the direction we had to follow. The weather happened to be very thick, and objects even near at hand were very ill discerned through the thick and drifting snow. The barometer continued to rise after the gale began to moderate, the sky cleared up, and, when our course up the Strait was resumed, everything around us put on a cheerful aspect. Hundreds of icebergs, with pinnacled tops and overhanging cliffs, streams of ice much broken-

up, and the impenetrable pack in the middle of the Strait, could be seen all moving imperceptibly into a warmer climate; while large flocks of loons and eider-ducks were led by instinct to set their faces upon high northern latitudes, into which they were attracted by the "swelling curve" of the returning sun.

It would be impossible to estimate the numbers of these birds that were seen and passed, as we crossed a well-known bank off Reefkoll (or Riscoll, in the Danish language), where, doubtless, they can find abundance of food to fatten them, before "pairing off" to the cliffs and islands, at the commencement of the breeding season. The depth of water on the bank varies from fifteen to fifty or sixty fathoms, appearing to deepen gradually from the shallowest part, which runs parallel to the adjacent coast; and, as one can readily suppose, icebergs and drifting ice are detained on and around it, although the former are not equal in height to those seen in deep water, in other parts of the Strait. Its situation is probably the point of junction of the eastern-northerly, and western-southerly currents. The effect of such a meeting would be the deposition of substances borne along by the water. Icebergs and coast-ice, seeking southward, would be arrested or delayed in the eddy, and their precious loads of mud

and angular fragments of rock as well as rounded pebbles, would be precipitated to the bottom, the result of which would be, a bank increasing in extent and height, until its surface would rise to a level a little below the surface of the water, and following the direction of the eddy, in which the process of deposition commenced. Supposing this bank not to be the result of this sure process of deposition, which may have been going on for thousands of years, but an elevation resembling in its general features the land on either of the adjacent shores of Davis Strait, the sounding line would now stop at fifteen fathoms; and half a mile on either side it might run out two hundred, before reaching the bottom; and the intrepid whaler would have his whale-lines cut or broken, by being entangled in the irregularities of its surface, just as happens on the western shore of the Strait, where the bottom presents little else than a solid rock, with all the irregularities of the immediately adjoining coast. The direction of this bank is from north to south; but its exact extent is very ill-defined. In the end of May, and in June and July, cod-fishing can be carried on in this part of the Strait with great advantage. I have known four lines, double-hooked, haul up upwards of six hundred fish in the course of four hours. The lines were many times not per-

mitted to reach the bottom until they had hooked the fish, and required to be hauled in. Halibut (*Hippoglossus vulgaris*) is also very abundant. The cod-fishing vessels, which visit Davis Strait every season, use the halibut to bait their hooks; but the half of what is caught cannot be required for that purpose; so that this fish often comes in for the fishermen's food, while fresh, or it is thrown overboard. We have great reason to regret, that it is not in our power to establish curing and drying stations along the coast; for, were this practicable, the excellent fish, with which those seas abound, could be brought into our markets at a higher remuneration, than fish similarly cured on the coast of Newfoundland. Some of the numerous islands along the coast are particularly well adapted for this purpose; the sanction of the Danish government would be easily obtained, as it would not at all interfere with the settlements along the west coast of Greenland. It often occurred to me that the ships, after killing and salting forty thousand, or as many cod-fish as could well be taken, might "seek across" the Strait to its western shore; this might be reached in a day, or two, according to the state of the ice, and in this case they could engage in drying the fish and preparing it for the market, before

thorough saturation with salt could possibly have happened. I do not think this plan has ever been tried; but until some such system be fully carried out, it is very improbable we shall be able fully to appreciate the importance due to Davis Strait, and the superiority of the fish frequenting its banks.

There is little doubt that a dredge, used carefully on Reefkoll bank, would amply repay the toil of the naturalist; for where great shoals of fish, especially the voracious cod, are met with, there also must their food be in great abundance. From my recollections of a voyage in 1846, I think this food consists chiefly of Crustaceans and Annelides, and perhaps, also, of Mollusca belonging to several genera, of which the Doris, Syllis, and Crangon constitute the greatest part. They may, and doubtless do, devour other fish, but I could never see any in the contents of their stomachs which were discharged, when they weltered in scores upon the deck, in their dying struggles.

It is generally believed that this fish migrates every season, into this part of the Strait from a more southerly latitude; but some are of opinion that even in the depth of winter they can be obtained by cutting a hole in the ice, and putting down a baited line. This opinion, however, was not borne out by

our experience this season; for our lines, although very carefully attended to, proved quite unsuccessful: and this we accounted for by the supposition, that the season for their return had not then arrived. As the beluga, or white whale (*Delphinus albicans*), was very numerous at this time, so also, it may be said, was their food, which is essentially fish, and, as some say, the cod.

The teeth of the white whale are ill adapted for mastication, as they are entirely prehensile; hence, a large fish like the common cod, even although below the ordinary size, would be an unmanageable morsel in its narrow gullet. Moreover, when the cod-fishing banks are teeming with myriads of the finest fish, the white whale is not to be seen near them; for, long before that time, it has proceeded far to the northward, where the genus Morrhua is never seen, but where its place is occupied by another and a closely allied genus, the Merlangus, which, I believe, constitutes the principal food of several species of seal as well as of the white whale.

It was very pleasant to see "schools" of white whales passing close to the ships, and appearing not to feel the least alarm from a very close approach. Their pastime seemed to engage all their attention. I often thought they would strike the ship's

side or stern; but the slightest deflection of the head and body carried them underneath the bottom, and, in a few minutes, they again appeared at the surface several hundred yards before us, where the old and young, the latter distinguished by their darker colour, moved on as if their rapid progress in the water and their sudden evolutions increased their enjoyment. There can be no doubt they were then in quest of food, as they always are; but if the habits of any creature yield a life of constant enjoyment, surely it is so with the frolicsome groups of these animals, with which the eye and ear of the Arctic voyager become as familiar almost, as with the sea around him.

May 1*st.* — At noon the latitude was found to be 67° 30′, and our distance from the land was not above twenty miles. It could be seen very plainly from time to time, although occasionally it was enveloped in dense clouds, which were drifting rapidly before the easterly wind. Our course to the northward was midway between the "pack," which could also be seen, and the land. According to Captain Penny's instructions, it was necessary to endeavour to keep within sight of the pack ice to seaward, and the fast ice along the land. The extent of open water was sometimes so great, that, to avoid losing our view of

the middle or pack ice, our distance from the land had to be considerably increased. Many were our conjectures as to the cause of so much open water, the general opinion being that the season was unusually early, although of this no person could be certain, for the ice in this part of Davis Strait shifts so rapidly with a gale, that an inexperienced person would be apt to think it had sunk, and not drifted out of sight. It often happens that one or two south-westerly gales, followed by northerly and easterly winds, leave a great extent of open water in the Strait from the Arctic Circle, up as far as the 70th degree of latitude, beyond which there will scarcely be anything but an impenetrable barrier of ice both in the form of "pack" and fast ice; the latter varying in extent according to the conformation of the adjoining coast and the period of the spring, whether late or early. A south-west wind eases the pressure of the ice at Cape Walsingham, where it is generally very close in spring, and causes a complete blockade at the north end of Disco Island, while the sea, from this point down to Holsteinberg, becomes more or less encumbered with loose drifting ice, which the first easterly or north-easterly breeze will drive out of the narrow part of the Strait, and considerably to the southward, with-

out effecting the slightest possible change upon the ice off the north end of Disco and Hare Island. With this in view, it is easy to account for a large extent of open water here. As a general rule, the whalers do not like a great extent of open water off South-east Bay and Disco in the first week in May, for the reason, that their attempts to capture whales will generally be unsuccessful, and their chances of an early "north passage" will be greatly diminished. They may, however, succeed in rounding the "middle ice" after the ice among the islands has dissolved where it formed; but their arrival on the west side of the Strait will be too late, to take advantage of the early visits of the whales to Pond's Bay. It will be seen afterwards, that these difficulties will be greatly obviated by beginning to "seek" north at a much earlier period, and before the "land ice" breaks up close in with the rocks. The seasons differ in Greenland as well as in Britain, and the ice on the seas there will be influenced by these differences, in the same way as our rivers, and many other natural objects depending upon meteorological phenomena, do not always present the same features at the same time every year. As certain as our rivers swell every season and again subside, so certain is it, that the ice in Davis Strait assumes such

positions and undergoes such changes as will enable ships to make a passage to the northward, between the loose ice in the middle of the Strait and that which is fast to the land along its eastern shore, if they but lay themselves out exclusively for that special object, and be on the spot in time to embrace the earliest opportunity. For an early passage I do not think there are many opportunities, but still they are as certain in the month of June as in the month of August, if not much more so, while in July it is a hap-hazard sort of business which cannot be depended upon. It will be seen, by consulting Dr. Scoresby's table of the times of passing the middle ice by the whalers, that in sixteen out of twenty-nine years the ships crossed in July, in eight years in June, while in only four years did they cross in August; and it will be a proper inference to draw from such a table, that in July there are the best chances of getting through Melville Bay and round the "middle ice." But in coming to such conclusions, it will be proper to bear in mind, that the whalers remain on the outlook for whales between the 65th and 71st degrees of latitude until the 20th of May, and even later, thereby missing in all probability the most favourable opportunity which is afforded throughout the whole season

for making a quick and safe passage in the so much desired direction. From latitude 67°, where I presume the land ice begins to jut out into the Strait, up to Sir Thomas Smith's Sound, of which we know very little, the west coast of Greenland presents a very irregular edge to the advancing and receding tides, and in some parts there are deep bays and fiords, which run fifty miles at least to the eastward of some of the outlying islands and prominent headlands. During the long Arctic winter these bays and numerous indentations, with one or two exceptions, become frozen over, and present one continuous sheet of ice, the free edge of which, being on a line with the outside of all the islands and headlands, becomes the eastern boundary of open water between it and the drifting ice in the middle of the Strait. On the return of spring and summer, the ice in the bays begins to melt away, break up, and drift loosely about; and before the middle of June, as far north as 73° 30′, it becomes so weak, that men, walking over it, are in constant danger of falling through. Now, it will be very clear that navigation cannot be conducted with the same facility, when the land ice is reduced to a rotten "pack," as when it was a firmly fixed floe, which could not fail to maintain its position in spite of the strongest north-easterly gales,

which, in their turn, would remove the "middle ice" ten or fifteen miles from it.

In the month of August the top of Baffin's Bay may probably be reached without touching or even seeing a bit of floe ice, but there are also equal chances of being then beset in an extensive field of ice, in which a ship may drift helplessly about, and be frozen in for the winter. Far be it from me to advise the intrepid whaler what course to pursue, for Davis Strait and the Greenland seas are his domain, and no one knows them better than he does; but still I cannot help thinking, and for good reasons too, that the great chances of making a quick "north passage," and getting early into Pond's Bay, are well worthy of the risk of losing a few chances of a whale or two in the "east water."

May 2nd.—During the early part of the day we stood pretty far off, and had gained a tolerable northing, for the wind was easterly; when the ice was reached, a few tacks were made along its edge, and then we stood in towards the land, which I suppose was not less than twenty miles distant. Loons and eider-ducks (*Somateria mollissima*) were very abundant on the water, and all seemed to have set their faces to the north. There were not many icebergs in this part of the Strait,—perhaps one could count twenty or thirty from the deck,—but a great

many more were seen, from the Crow's Nest, at an elevation of about ninety feet.

Towards midnight we were within two miles of Leively, a Danish settlement on the south end of Disco, and a number of Esquimaux came off to us. Although their dresses were very filthy, and there seemed to be little regard paid to cleanliness, they appeared to be a lot of hearty-looking fellows, who could conduct themselves very respectably indeed. They cared very little for anything that we could give them, and with the exception of a few tobacco purses, for which they took cotton handkerchiefs, they had nothing to barter.

Captain Penny and several others went on shore, to leave letters and make inquiries respecting the weather and the probable condition of the ice in the Strait, but more especially respecting H. M. S. "North Star" and the missing Expedition under Sir John Franklin. The Governor was absent from the settlement; but we were kindly received by the Sub-Governor and his lady, who, although it happened to be the untimely hour of one in the morning, did not fail to exhibit that high sense of hospitality which prevails among the Danish settlers from near Cape Farewell to Uppernavik. We were entertained with an ample repast, consisting of coffee, bread (baked at the settlement), excellent Danish butter, fish,

quite fresh (halibut), and venison equalling the best that ever came from Braemar, Aberdeenshire.

The Danes were very glad to learn that there had been a cessation of hostilities, even for a time, between their much beloved country and the Prussians and Germans, in the war about the disputed territory of Schleswig. We were informed by the Sub-Governor that the winter had been rather severe, and that the wind prevailed lately from about east, which he said had been the cause of the Strait being so clear of ice at its lower part. Captain Penny made inquiries whether he could get one or two Esquimaux, at Leively, to accompany the Expedition; but the inducements he held out were insufficient to prevail upon *the Innuit* to leave their fond homes. He could have got some dogs; but, at present, he declined taking any, in consequence of not having food for them, trusting that as many as might be necessary could be obtained at some of the most northern settlements.

After remaining about an hour and a half on shore, we came off to the ships, and in a few minutes our widely spread sails hurried us along before a smart southerly wind, which began to "come away" about midnight.

Disco Island is situated on the 70th parallel of north latitude; its greatest length, from N. W.

to S. E., is about eighty-five or ninety miles, and its breadth not much more than fifty miles. It is separated from the Greenland coast by a strait called the Waigat, which runs between it and the Bunke Land, and varies in breadth from eight to twelve or fifteen miles. There is a second strait, about eight miles in breadth, called the Malegat, which runs east and west between its northern extremity and an island, called Hazen or Hare Island. A small fiord, which in many parts is only navigable by boats, runs tortuously to the eastward through the south end of the island, and nearly isolates a small portion of it; on this the settlement of Leively has been established, on account of the conveniences which its insulated position affords.

This portion of the island is very low, appearing to resemble the Whale-fish Islands, which are but a few miles to the southward, and the rocks, of which it is composed, are of the hypogene formation: one can pick up granite and gneiss, wherever the rock protrudes through the snow, all round the settlement. In the fiord, too, the same rocks appear above the water, and often detain the drifting ice after the tide has gone back. Immediately on the opposite or north side of the fiord, the island rises, almost suddenly, to an elevation of about one thousand feet; and, to the north-east of the settlement, it is in many

parts altogether inaccessible. The rocks never overhang, but they frequently ascend perpendicularly, and present a succession of steps, which at once conveys an idea of their volcanic origin. Viewing the island from a distance of ten miles to the westward, it appears to be made up of a number of truncated cones planted so closely together, that the bases of all meet, some at the level of the sea, bounding long and winding valleys, and others at every intermediate point, until the top itself is reached. The waters around it vary in depth very much, as can be easily supposed from the nature of the rocks on which the island rests. In Disco or South-east Bay, icebergs two to three hundred feet in height may be seen drifting into Davis Strait, on either side of the Whale-fish Islands. In the Malegat and Waigat, I have seen whole clusters of these floating islands, drawing from one hundred to two hundred and fifty fathoms, moving to and fro with every return and recession of the tides. I looked very earnestly for grooves and scratches left by icebergs and glaciers in the rocks, but always failed to discover any. If there have been any, the disintegrating action, which goes on so rapidly in the Arctic Regions, must have defaced them long since.

In the afternoon we were within a few miles of Hazen or Hare Island. This island is rather flat on

the top, although on three of its sides—to the Waigat, Malegat, and Davis Strait—it descends abruptly to the water's edge; but on the north side it slopes down gradually, and makes the ascent very easy. The north end of Disco slopes in a similar manner at its north-western point, but exactly the opposite obtains at the north-eastern.

I believe coarse coal, or anthracite, has been found in seams in those two islands, both by the Danish settlers and the whalers, but probably not to any great extent; for were it so, the Danish directorship would not have whole ship-loads of coals exported every season to the Greenland settlements.

The high northern latitude of Disco and Hare Islands renders their Flora and Fauna very limited. Ptarmigan and hares are very abundant throughout the whole year; and during the winter months reindeer cross the Waigat on the ice, and appear frequently upon the remote heights, and in the valleys of Disco, in great numbers. The numbers of the latter, which the Esquimaux kill, on the Bunke Land during the summer months, are altogether incredible. I have heard on the best authority, that a number of natives, having gone up some of the deep fiords to some highly favourable locality, shot several hundreds for the sake of their tongues alone,

after they had filled their luggage boats with the skins and flesh of those animals; and this is by no means an unfrequent occurrence. They kill fewer during winter, and would then be glad of the carcases they had left to bleach in the weather, on the rugged slopes of the hills sixty to seventy miles inland. The creeping willow and black crowberry (*Empetrum nigrum*) are the largest plants met with, and, although growing most luxuriantly on the southerly exposed slopes, they appear in very humble contrast with the noble and lofty white fir trees (*Pinus Abies*) of Norway and Siberia, although the latitudes of the latter are much higher than that of Disco.

As night approached, the wind ceased to blow so keenly, but still there was enough to give the ships steering way. North-east Bay, an extensive inlet, had to be crossed before we could advance to the northward. The ice in it was found to be in the form of a loose pack, with the exception of from ten to fifteen miles at the very top, where it was still continuous with the land. We had great reasons to regret that we were not here earlier, when the ice was permanently fixed from side to side: even two or three days might have made a great difference to us. It was very plain to Captain Penny, that the land ice must be followed right round it, making a circuitous passage of a hundred miles instead of not more than fifty miles, the distance

from Hare Island to Svartehuk (Black Hook), and which could have been very easily accomplished, when the ice was still unbroken.

North-east Bay is at least one hundred and twenty miles in depth, if the top of Omenak Fiord and Svartehuk be considered its boundaries to S. E. and N. W. The tide in it is very rapid, and the water is very deep; hundreds of icebergs, upwards of two hundred feet high, and requiring at least three hundred fathoms water to float them, may be seen changing their positions, and ploughing up whole fields of ice, under the influence of the tide alone. It was at one time a famous resort for whales, and many a good and large whale has been captured in it, but of late years it has been almost entirely deserted. It is very difficult to account for this fact. It cannot be supposed that the food of the whales has undergone such a change as would render it necessary for them to shift their ground. All the whaling captains to whom I have spoken on the subject, think they have been hunted off the ground from year to year, until now they are in a manner alienated from one of their most favourite haunts in the whole Strait.

In endeavouring to circumnavigate such a bay as this, when it is full of drifting ice, great difficulties are encountered, for the wind, which might suit on one of its sides, is exactly the opposite on the other

two sides. For example, a south wind will open the ice along its southern shore, but it only does so by pressing it harder at the other two sides. However, when ships succeed in reaching the north side it is considered that the battle is fairly won, for then the first northerly wind sets them clear if they can avoid being carried away in the loose drifting ice.

Three or four whalers were seen late in the evening, and they seemed to be all seeking their way north among the ice, as the narrow lanes and "leads" would permit them. They did not appear to be in chase of whales, although certainly among such favourable "streams" of ice they would have been very glad to see them, and get fast to them.

The sea was very smooth, and there was not the least perceptible swell. It teemed with Acalephæ; the genera Medusa, Cydippe, and Cyanea were seen in the greatest abundance; and nothing could exceed the beauty of the prismatic colours and rapid ciliary motions of *Cydippe pileus* and *Cydippe cucumis*, or the graceful motions of *Dionæa glacialis*. The common seal (*Phoca vitulina*), and occasionally the bearded or great seal (*Phoca barbata*), and saddle-backed seal, which is exactly the same species as the *Phoca Greenlandica* (there being no difference between them, except that the fur of the one is

of a lighter colour than that of the other), were frequently passed, reposing with the utmost safety and comfort on their frozen bed. If at any time the ship happened to be very near a small floe containing one of these seals, the wary creature might be seen raising its head, and directing its large watchful eyes upon us as the distance from it became shorter and shorter; and generally, before we were within rifle-shot, it went plump into the water, after a few very awkward hobbles on the ice. I did not see any walruses in North-east Bay at this time, although one or two had been seen since we came into the Strait. They are not one hundredth part so numerous as the seals,—I may almost say as any single species of seal. They are much more numerous in the seas around Spitzbergen than in Davis Strait, but even there the proportion to the seals is an infinitesimal fraction.

Towards midnight the sky became overcast, the wind veered a few points westerly, and there were all the appearances of an approaching fall of snow, if not of a regular storm. We stood in for the bottom of the bay, with the expectation of reaching the fast ice if no lanes or "leads" would afford a passage in the direction of Cape Cranstown or Svartchuk.

May 4th.—About six o'clock in the morning we

came up with several whaling ships which, like ourselves, were anxiously waiting to get into a large open water off the Black Hook, where they expected to capture a few whales; but the westerly wind had brought the loose drifting ice into the bay, and into the closest contact with the "land" or fast ice on its north-eastern side; so that to advance a mile further was utterly impossible. As our sole object was to get north as speedily as possible, Captain Penny thought the best thing that could be done, under the circumstances, was to get to the eastward, as far as the drifting ice would allow, and there remain beset at the land ice or in open water, as the case might be, until a shift of wind or the tide in calm weather would open the ice, and allow us to advance in a northern direction. The whalers, however, did not accompany us in this step, expecting, and properly enough too, to fall in with whales in the entrance of the bay, or to the westward of Hare or Disco Island, where they could sail about between the ice in the offing and the land. Before noon our two little ships were for the first time closely beset at the land ice about fifteen miles off Niakornak, a small Danish settlement which is subject to the governorship of Omenak or Four Island Point. The rudder was unshipped, lest the pressure among the ice might injure it, and it was slung across

the ship's stern, or removed to the level floe alongside. This is an operation which generally occupies about five to seven minutes; but frequently much less time, according to the rapidity with which the pressure is coming on.

The wind blew keenly from west or north-west, and there was a constant falling of dense, soft, and flaky snow during the greater part of the day; towards night, however, the wind moderated considerably, but the sky always continued overcast, and the snow was falling thick around us. Nothing could be seen but ice and snow in all directions, except a small triangular space of water which two large floes, meeting at an angle, prevented being filled up, and where we had some sport with several flocks of loons which frequently visited it.

This was our first Saturday evening among the ice, and, as is customary among seamen wherever they are, our friends at home were then fondly remembered. The passage across the Atlantic and thus far up the Strait had occupied but three weeks. To have advanced so far in so short a time was very satisfactory, and produced pleasant reflections; but owing to the apparently advanced state of the season, from the condition of the ice in this and other deep bays, we had every reason to suppose that our arrival had been at least one week

too late; and even the most sanguine among us could not indulge for a moment in fond expectations that our passage north and round the "middle ice," after crossing Melville Bay, the king of bays, would be early or easy.

CHAP. III.

PASSAGE FROM NORTH-EAST BAY TO UPPERNAVIK.

Young Ice. — Intense Frost. — Parhelia. — Closely beset. — Seals at their Holes; Attempts to shoot them. — Ill Success of the Whalers. — Esquimaux on Board. — Their happy Condition at the Settlements. — Fearful Disasters among the uncivilized Esquimaux. — State of the Ice. — Slackening. — Swell perceived. — Ships get clear. — Forms of Icebergs, and their Size. — Access to the Northward. — Southerly Wind. — Taking the Pack. — Violent Pressure. — Ships in Danger. — Stones found on Icebergs. — The Arctic Fox at Sea. — Ice opening. — Long-tailed and Eider-Ducks; their Food. — Entomostraca of large Size. — Moored to an Iceberg. — Loss of Rudder. — Favourable Wind. — Open Water. — Birds flying north. — Sea Storm. — Met by the Ice. — Passage close in Shore. — Volcanic Rocks. — Ptarmigan. — Arrival at Proven. — Capture of a White Whale. — Putrefaction early in the amphibious Mammalia. — Teeth of Beluga prehensile. — Esquimaux adrift. — Cruelty to Esquimaux Dogs. — Infusoria found under peculiar Circumstances. — Colour of the Sea. — "Sophia" falling behind. — Proven. — Brown Slime — Character of the Coast. — Home-Sick Esquimaux. — Intense Heat. — Saunderson's Hope. — Loons, and their Eggs. — Abundance of open Water — Uppernavik.

May 5th, Sunday. — The stormy weather and snow of yesterday gave way to better weather, and before mid-day we could see the sun, as the dense clouds settled down, and the clear blue sky beyond came into view. The land all around could also be seen,

except where it happened to be enveloped in a whitish mist, which sometimes covered like a blanket the tops and sides of the snow or ice-clad hills. The temperature of the air fell considerably below the freezing point of water, and there was a young formation of ice on the surface of every drop of water that could be seen around us, which cemented the loose ice closely together, and made walking among or over it very safe. The thickness of the floe which had not yet shifted its position, was about four feet; but it varied, being much thicker in some parts, owing to overlapping when in a young state, and subsequent congelation. The thickness of the pack or drifting ice varied still more; for in some parts one would meet with it ten to fifteen feet thick, and in other parts, perhaps, not more than two or three inches. This was undoubtedly owing to very recent pressure. Pressure among ice facilitates the thawing process, when it happens during the summer or autumn months: the breaking up and reducing to fragments expose a much larger extent of surface to the action of the sea, and to the rays of the sun, than could have been exposed in the originally solid and continuous floe.

In the evening a hard frost set in, which we feared would continue for some time, for the weather had a very settled appearance. Towards midnight, when

the sun was getting very low, two beautiful parhelia, possessing all the prismatic tints, were seen, as a thin film of frozen vapour pervaded the horizon, and obscured our view of the land at the base of the hills, while their summit, which was rarely free from clouds or mist during the day, could now be traced in every direction with the utmost precision. It occurred to us that there might be some interest in ascertaining the difference of temperature of the air at the surface of the ice, and at the top-gallant mast-head; the thermometer at the "Crow's Nest," in the shade, indicated + 8°, and on deck + 2°. This difference, which was much greater than, and exactly the reverse of, what we expected, we endeavoured to account for, by the entire absence of the sun's rays from the deck, while they beamed with great brightness from the rugged land to the northward, exactly over the mast-heads. It might also be accounted for, by supposing that the frozen surface of the earth had still the power of imparting cold to the air, by which its weight would be increased, and it would remain in a stratum along the horizon. I had often seen sea-fowl flying high and low, without any apparent cause; but now I would be disposed without hesitation to assign the reason to difference of temperature in the strata at different elevations.

May 6th.—The weather was remarkably clear and pleasant. With the exception of a few white clouds on the horizon, the sun performed his daily round upon a cloudless sky. There appeared no signs whatever that our release would be early; for ordinary weather could hardly open the ice, which had been set together so closely. The wind would require to blow with considerable force from east or north-east, before we could look forward to getting clear of the incumbrance which surrounded us on every side. A good opportunity was afforded by this delay for preparing the ships for the navigation of ice, which might be too close for sailing. Ice-anchors, warps, and tow-lines were got ready; and as we might expect calms, in the absence of steam, our boats were put into an efficient state for towing.

A few seals were seen on the ice between us and the land, each taking his repose on the brink of the hole, which he had kept open with great pains during winter and spring. The small seal (*Phoca vitulina*) is the only one that comes up through holes in the ice, which it makes and keeps open for itself; all the other species of seal come up over the edge of the ice, through openings caused by the winds and tides, and they never appear except where such openings occur. The attempts of our sportsmen to shoot them at their holes were always unsuc-

cessful; the sound of footsteps on the ice never failed to reach their acute ears, long before we could approach within rifle-shot of them. Crawling on "all-fours," or, I should rather say, on knees and elbows, behind a white calico screen, which occupied the left hand, while the right held the rifle on full cock, we were enabled to approach much nearer; but, with all our care, our stratagems were completely unsuccessful. It was suggested that some of our party should go as far as the land for the sake of shooting deer, as well as to communicate with the Danish settlers; but this was overruled by the expectations we entertained of the ice opening, before the party could return from such a great distance. We could see four or five whalers in open water, off the north end of Hare Island, and one whaler was beset either among the loose ice, or at the land ice, about seven miles to the north-east. This was a very unfavourable time for them, and more especially for the one that was beset; for his chances of doing anything in the way of whaling were absolutely reduced to nothing. Perhaps he might expect to get first north, and it was with this view that he ventured so boldly into the ice; but as matters had turned out with him, he had lost the chances of the others in the offing, without realising even a promise of any benefit from the step that he had taken.

May 7th. — The weather still continued clear and fine; indeed, in all respects pleasant: but it had small gratification for us, who were not permitted to advance a single foot. The ice, about eight miles to seaward, opened out and drifted loosely before a gentle north-easterly wind for a short time; but it soon returned, and again went off with the tides. Icebergs, too, but not of very large size, were carried to and fro by the tides, and it signified little whether they or the drifting ice were in motion; for the latter always suffered by being in close connection with the other. Observations were obtained, and the latitude and longitude were found to be 71° 5′ N. and 54° 16′ W.

In the afternoon a sledge was observed coming towards the ships from the land; and, after a journey of at least twenty miles, in which the poor dog's feet had suffered a great deal, as was evident from the blood-stained track, two natives, real "Innuit," the father and son, came on board. Like the Esquimaux at Leively, they were very respectful in their manners, and answered questions put to them without being in the least excited. They had never heard of the Expeditions we were in search of, and they expressed great sympathy for the poor men, who had been so long unheard of by their families and friends. The youngest was a boy of

about fourteen years of age, in whose features could be traced every mark of the Mongolian character. His black, long, and straight hair, black eyes, broad nose, flat and broad cheeks, and sallow skin, at once indicated this variety of the human race. There was a graveness and softness in the expression of his countenance, and a modesty in his look, which could not fail to attract every one who saw him; and, moreover, he was not ignorant; for his careful teacher had bestowed great pains upon him, of which he appeared to be worthy. When he came into the cabin, his respect, for those whom he considered better than himself, was exhibited by uncovering his head; and when he heard the solemn strains of the Old Hundredth Psalm issuing from our barrel organ, he hung his head, and appeared wrapt in humility, before what he had been taught to believe was the language of another world. In many respects he was to be envied,—for he was really happy. He knew none of the evils of the world, and, at the same time, possessed all the blessings of the Christian religion. He enjoyed all the freedom of his unenlightened ancestors, without exposure to any of the dangers peculiar to their wandering life, or without suffering any of their miseries. The Esquimaux of West Greenland owe a debt of gratitude to the Danish government

and the settlers which cannot be paid. Through the unwearied exertions of the missionaries during the last hundred and thirty years, the condition of the natives has improved very much; and one never hears now of the appalling disasters which were once so common among them, and are still very usual on the opposite side of the Strait among the wild Esquimaux. A whaler, I believe the "Joseph Green," of Peterhead, fishing on the west coast, observed something on a piece of ice which was drifting rapidly and directly away from the land before a smart breeze that was blowing at the time, and, on approaching sufficiently near, it was discovered to be a group of human beings, whom some mishap or carelessness had detached from their home, and delivered over to the mercy of the wind and sea, without a ray of hope that a single soul should ever be permitted to rejoin those they had left behind. The captain of the whaler rejoiced that he fell in with those poor creatures, who were thus providentially saved from inevitable destruction. There are not always ships at hand, however, to pick up every Esquimaux, or whole families of Esquimaux, who, without any doubt, are often similarly situated. If to this be added the horrible ravages of famine among the Esquimaux of Arctic America, which in part, at least, is British territory, surely there will be

inducement enough for the philanthropic in Great Britain, to follow the example of Denmark in its zealous endeavours, to ameliorate the condition of these poor and inoffensive creatures.

Through the kindness of the Esquimaux, we had opportunities of sending letters and despatches to the settlements, to be forwarded to Denmark by the Danish ships, and thence to England. There were, however, more than two Esquimaux, who vied with one another in the respect which they paid to us. I believe there was one person who would have liked to have got a second glass of spirits. This was our fault; for we ought not to have led him into temptation, when we knew that the Danish settlers very rarely indeed give the Esquimaux ardent spirits. At the settlements they generally get only three glasses of spirits during the whole year,—on Easter and Christmas Days, and on the birthday of the King, to commemorate these joyous anniversaries. This contrasts favourably with what is usual in our colonies, where we find the poor natives the victims of intemperate habits, even after a few years' experience of civilisation.

May 11th.—A party of two or three men were observed coming towards our ships from the ship that was beset seven or eight miles further on. It proved to be the "Abram," of Hull, and the object of the

party was to get some medicine for the commander, who was suffering from a severe attack of pleuritic inflammation. The medicine that was demanded was supplied from the stores of the "Lady Franklin." It was reported by the party, that had they been but two or three hours earlier on Friday evening, the 3rd of May, they would have succeeded in getting into a very extensive space of open water off the Black Hook, which they saw very distinctly on their first arrival, but could not see next day, from the ice having drifted into it during the south-westerly wind. Every one of the whaling masters had the same story to relate. They all seemed to agree that the season was very early, and that, to have been in time for an early north passage, they ought to have been off North-east Bay in the beginning of the last week in April at the farthest. After about an hour's refreshment, the party left us, and, in less than three hours afterwards, they were observed arriving safely on board their own ship. The loose ice in the offing was departing by little and little from the main body, which still remained firmly fixed to the land ice, at which our ships were lying. After six o'clock in the evening, a small party took a "stroll" over the recently cemented pack in the direction of the edge of it, where open water was making very fast, although not quite so fast as we could have

wished. The young ice, which had formed on the water in the small openings between the angular floes during the hard frost, was not above five or six inches in thickness; and in some parts, where the pools had been large, not more than three; but even on the weakest of it one could walk with the greatest safety, although it yielded at every step. When we reached the edge, a very slight swell was perceived in the water, and it appeared to be imparted to the ice on which we were standing. This was rather a good sign; for we could naturally expect it to break up the connection between the two *ices*, and permit us to go free. But this happy result could not well be anticipated without, at the same time, associating with it the chances of the ice breaking up which lay between us and the land; in which case, we ran the risk of being carried about, for a short time at least, in the loose drifting ice. As usual, icebergs of small size could be seen changing their positions with the tides, and reducing the ice around them into fragments, which would soon appear in the form of water under the increasing influence of the sun's powerful rays.

A boat was observed coming from the "Advice" whaler, under the command of Mr. Reid, brother of the ice-master of the "Erebus." Having left our native shores fourteen days later than the "Advice,"

we had letters for her crew and commander, who had the kindness to give us one or two old blubber-knives, and other instruments, which in our bare state would be very useful, if good fortune should send a small whale or a unicorn in our way.

The weather was very mild and pleasant during the greatest part of the week. The temperature had been rising gradually, and it was up to +34° and +36°, with good prospects of a continuation of the favourable weather, and of an early release from the ice, as our second Saturday night approached and passed away. A meteorological register, with entries made every three hours, was begun on board the "Sophia;" and our hopes that the regularity which such an important duty demanded would, I trusted, not prove to have been ill-founded. The temperature of the sea-water varied a few degrees occasionally; but it was generally found to be about +29° or +30°. It was frequently observed, that if there had been a diminution of the atmospheric pressure, as ascertained by a fall of the mercurial column, or by the indications of the aneroid barometer, during a northerly, easterly, or south-easterly wind, we might look for a regularly set in storm from some point to the westward of south or north.

May 13*th*, *Monday*.—Yesterday morning the "Joseph Green," of Peterhead, hoisted colours to the Expedition, and before mid-day Captain Penny, and Mr. Stewart, commander of the "Sophia," went on board. They returned in a few hours. Soon after midnight, the swell was perceived in the pack ice around the ships, and in less than half an hour a lane of water was observed, opening out in the direction of the "Abram," which still continued closely beset. Every preparation was made for getting under weigh; and now that the ships were free to move about a little, the rudders were shipped. We had the most sanguine expectations that our progress around North-east Bay would now be uninterrupted, after being detained so long already; but, to our utter dismay, the ice between us and the land gave way, and crack followed crack, until a continuous sheet of ice, five miles in extent, was reduced to a number of flocs, which proved very troublesome to us before we got clear of them. It will be enough to state, that both capstan and winch were necessary before we got into the clear water, which by that time was much nearer, probably within one mile and a half. After four or five hours' severe toil, in which every person engaged, we got into open water where there were eight or nine whaling ships. Fifty or sixty bags of coals were

transferred from the "Joseph Green" to the "Sophia" in a few hours in the forenoon. Some of the whalers thought their best chances for whales would be in the offing; others, again, thought it would be preferable to await the chances of getting into the Black Hook water, where they felt sure whales would be found in great abundance. At present, they could go neither in the one way nor the other; for there was no wind, and no effectual separation had taken place between the loose ice in the bay and the land ice. A great many icebergs were seen, as the ships lay motionless in the water; and as they appeared to run together on the far distant horizon, an idea arose that they were so close that no ships could pass between them. Some of them were in the form of large square cubes, with flat and horizontal tops; others, again, presented every variety of form, now resembling cities and villages, now ruins; and, again, you might imagine one to be a solitary country church, in the modest Gothic style, rising beautifully above the level plain, on the distant horizon, and adding a sacred charm to everything around it: some appeared to be loaded with huge boulders and mud, shortly to be precipitated into the sea which bore them along; while others were yielding themselves submissively to the

wasting influence of the sea, and the powerful rays of the sun.

There was one iceberg which was particularly noticed, because it never shifted its position, when others, of rather larger size, were drifting to and fro with the tides. It was about two hundred feet in height above the surface of the sea, and its perpendicular sides, which were nearly equal, were not less than two miles in length. The upper surface was horizontal, but very irregular, appearing as if it had been planted over with rough and irregularly conical eminences, packed closely together, and varying in height from twelve to twenty or thirty feet. The water lines at the level of the ice around it were also horizontal. There seemed to be no reason for any other opinion than this, that it had never changed its centre of gravity since it descended into the sea, and had become detached from the glacier which gave it birth. The cubic contents and weight of such a floating world are truly astonishing. This berg displaced upwards of eighteen thousand millions of cubic feet of water, while its contents must have been nearly twenty-three thousand millions of cubic feet, and its weight nearly five hundred and forty millions of tons. It is impossible that such enormous masses of matter, in a dense resisting medium like water, can be readily

put into motion by the winds: hence we find icebergs of very large size motionless, or nearly so, when smaller ones and the surface ice are carried past them with great velocity. The great depth to which they pass, places them in a great measure beyond the influence of ordinary tides. I believe it has always been observed, that when a number of icebergs are in motion under the influence of the tide, the largest moved least, while the smallest and the surface ice moved most of all. I have often seen a number of small icebergs carried backwards and forwards by the tides along and around a large one, which happened also to be in motion, as if a share of homage was due to it from them, although it might be far inferior to them in point of age.

Towards evening the "Abram," of Hull, which had been beset in the ice, got clear and joined the fleet of whalers, after being detained ten days, in which she could not move one way or another.

May 16th. — During the three preceding days, several attempts were made to advance to the northward in the direction of the Black Hook among the loose ice, but all of them proved unsuccessful. The whaling ships would now go to the offing, and remain at the edge of the loose ice there; and again they would take a look into North-east Bay, where they

rarely saw anything to encourage them to return. Their work appeared to be very discouraging; indeed, perhaps even more so than our own. Loons and dovekies (*Uria grylle*) were very numerous, and numerous were the shots that were fired at them by our sportsmen without material benefit. Unicorns (*Monodon monoceros*) were also very abundant, but no attempts were made to capture any. In the evening, as we approached the land ice, off Niakoranak, an opening was observed to be making between us and the opposite side of the bay; and thinking it might, after running so far to the eastward, lead in the direction we wished to take, we pursued that course, and were very soon again beset among the ice, at the land ice about ten miles E. N. E. of our former position. A dense fog came on about midnight, which obscured our view so much that, although the ice was not quite tight around the ships, we were forced to let them lie still, for fear of going away from what was so easily missed in clear weather. The whole crews had been up towing and tracking for ten hours; and now that the ships had to come to a halt, they were ordered to bed, except a watch of two or three men, who were ordered to report the slightest change in the ice, or clear weather.

May 17th.—At an early hour the dense mist

cleared away, and a smart breeze came off from the land which really promised to effect a change in the ice which would be very favourable to us.

The ships were again cast loose and plied to the eastward until noon, when we were again brought to a stand by the ice which had not opened out. By this time we were approaching the north side of the bay, and, as the wind seemed to cling to the southward, it became very unfavourable for us, by keeping the loose ice pent up ahead of the ships. In the early part of the evening the sky became densely overcast, and the wind, which had nearly died away, veered from east to south, and thence a point or two westerly, and increased before night to a perfect gale.

Captain Penny came to the conclusion, that it would be necessary to get into the open water again, lest we should get beset, and be in danger of drifting out of the bay, when the wind shifted; and "the two brigs," as the whalers designated our ships, were under a press of sail, and plying out into the open water. We frequently passed to leeward of huge icebergs, around which the wind swept in terrific gusts which often threatened to lay our little vessels on their beam ends. The lead, in which we had to ply to windward, was every moment becoming narrower; and at length, when we were within only half a mile of

the water, a large floe came drifting in, two points met and shut us in, and, after beating a retreat, the only alternative that remained for us was, to take the "pack." In taking the pack, the "Sophia" excited the highest admiration; I could have hardly conceived it possible to manage a ship to such advantage with the sails and rudder. On one occasion, when I, and others much more experienced, expected some damage to the rudder by a violent spring astern in the direction of a heavy floe, the slightest pull of the main braces, and hauling the jib sheet close in, changed her position so much, that she not only went clear of the ice astern, but also got into a pool of water ahead, in which she lay for three hours in comparative safety.

May 18th.—About three o'clock in the morning the ice began to set very closely together, and in a short time every open space of water was almost completely filled up. The ice all round us seemed as if endowed with life and the power of moving; it emitted deep hollow groans; and, if two or three persons happened to be sitting below in the cabin, a deep grazing sound could be heard against the ship's sides, which invariably interrupted the conversation, however interesting, as effectually as if a thunder peal had burst right over-head. Each looked his

neighbour in the face, and those looks never failed to bespeak the dangers of the situation.

Floe presses against floe; corners are broken off and overlapped; hummocks and ridges are raised in all directions; blocks of ice of all shapes, sizes, dimensions, and weights, from one to twenty, and even sixty, tons are raised up as it were by an "unseen power." Huge icebergs, of perhaps five hundred millions tons weight, plough up floes for miles and miles without being checked in their destructive course. Nothing is to be seen but ice, "living ice," in slow but sure and steady motion, and the surface, which an hour previously presented a level plain of pure white, with pools and meandering lanes of the blue sea, is now one complete wreck; the colour is changed to a mixture of a dirty white and blue, the evenness of the surface is destroyed by masses twenty feet above its former level, and a square foot of open water cannot be seen for many miles around. A scene is beheld by the Arctic navigator, which he finds it utterly impossible to admire, — a picture to him of wretchedness, misery, and desolation. When such changes take place among the ice, what can the ill-fated ship expect but her share of damage! to escape without it may appear impossible, but it often happens.

As soon as the "Sophia" was fairly in the pack

the rudder was unshipped; and, when the pressure began, she was taken on the stern-post with a heavy floe, and carried along, before it, at the rate of at least half a mile an hour (but with occasional short interruptions); her bow was raised three feet above its usual water line, and, by means of its obliquity, the thick floes were literally walked over with what appeared to be the utmost ease, while they were every moment breaking up and sinking underneath or passing alongside. I observed some of the pieces rising so high, that danger to the boats slung above the bulwarks was apprehended.

The pressure continued till six o'clock, during which time the ships were carried through floes several hundred yards broad, and the wake they left astern was ill calculated to lead to the idea that no damage had befallen them. It seemed to have been much more severe where the ships then were, than in any other part around us. This was owing to the presence of a large iceberg about four or five hundred yards astern, which continued to approach us until it seemed to take the ground. It was about two hundred feet high, and three quarters of a mile in circumference. In half an hour everything was as still as possible, the ships were in "dry docks," and, as far as we were able to judge, had not sustained the slightest damage. The crew

turned out one by one, and there were some preparations making, which proved to me, at least, that they thought the ship was in great danger. I think it proper to state also that even the commanders of the Expedition, who had seen the floes *walking over* ships, did not feel quite satisfied that we occupied a position of safety, when the pressure was every moment becoming more violent. They had every confidence in the model of the ships, and it was very gratifying to find that their build and structure seemed to fulfil their most ardent expectations.

May 21*st.*—The disagreeable south-westerly winds and, snow of the 19th and 20th passed away, and as there seemed few chances of our getting clear soon, some of us ascended the iceberg, and ascertained its height by means of the aneroid barometer. About half way to the top several pieces of gneiss and granite were found, some of which were deeply imbedded in solid ice, without any communication with the external air, and these, as well as the exposed pieces, were surrounded by what may be termed an atmosphere of water. The latter afford a convincing proof, of the power which ice possesses of transmitting the solar rays, without absorbing them. The violet rays are rendered visible, hence the colour of ice; and the red rays, which contain most heat, are transmitted.

There are many ways of accounting for the presence of these pieces of rock at this elevation on the iceberg. It had all the appearance of a berg that had changed its centre of gravity many times, both by pieces breaking off, as well as by dissolution. The fragments of rock might have been dropped upon a part of it, while under water, from drifting coast ice, which often contains large accumulations of shingle and mud; and, by subsequent change of position, these fragments would be raised to the elevation at which they were found, or even much higher. There is an objection to this, however, in the fact that they were imbedded deeply in the solid blue ice, which could hardly have happened, unless they had been dropped upon it while in the glacier.

The foot prints of a fox (*Vulpes lagopus*) were observed on the sloping declivities of the berg, and, from their apparent freshness, he must have taken his nocturnal tour in search of feathered prey since last night's snow. The Arctic fox is often seen on the ice at a considerable distance from the land. I recollect seeing a poor creature adrift on a detached stream of ice in latitude 68°. He was running from side to side of the stream, appearing to be quite alive to the dangers of his situation, but he never attempted to take the water. The ship, in

which I was at the time, was moored to a grounded iceberg, and as the stream came down against it, and was divided by it, I had an opportunity of throwing pieces of whale's krang on the ice, as it passed close by the ship's stern, and I saw the fox devouring a hearty meal, as soon as he had discovered them. It was very gratifying to me to think, that my curiosity had led to some mitigation of the sufferings even of a poor fox.

May 23*d.*—The ice began to slacken, and every now and then huge blocks were seen slipping into the water, while others, equally huge, came bumping from beneath the long projecting tongues, which extended in some cases to a depth of from twenty to thirty feet. Several lanes of water were seen extending in various directions, and long-tailed ducks (*Anas glacialis*), and eider-ducks, as well as glaucous and other gulls, began to afford us some sport. The long-tailed duck has a peculiar and unmistakable cry. Its trachea is ossified towards the base, where it appears to be inflated into a sort of bony labyrinth. These ducks are more easily approached than the eider-duck, and their flesh is considered a greater delicacy than that of any other sea-fowl found in the Arctic Regions. I examined the gizzard of one, with the view of ascertaining what its food consisted of; but, to my disappointment, it contained nothing but a few

particles of quartz and schorl. It is difficult for me to believe that the long-tailed and eider-ducks descend to the bottom, at a depth of two hundred fathoms, where they can resist the increasing density of the water, and gobble up their food in the short space of time which they can be absent from the surface. It is also equally difficult to associate the well-known habits of the *Anatidæ* with those of the auks which catch their prey swimming free in the water, without descending to the bottom. I always found in the stomachs of the ducks the remains of animals which never leave the bottom, while the stomachs of the auks contained little else than the *Gammarus Arcticus*, which swims in great abundance in the surface.

The sea abounded in animal life, although the *Cydippe cucumis* was the largest creature that could be seen. Entomostraca of very large size (*Cetochilus*) darted in the water with the swiftness of arrows; nothing could exceed the gracefulness of their motions, when, with every jerk, the two long oar-like antennæ were thrown elliptically in the form of curves along the body, but not touching any part of it, until they met at the last segment. It was only during the rapid movements of the *Cetochilus*, that the antennæ assumed this position, for it could be seen making slow progress in the water, with the antennæ at right

angles to the body. The antennæ are surmounted by a tuft of bristle-like spines pointing backwards. The last segment of the body terminates also in a number of spines or setæ, which, in many individuals, are of a beautiful reddish and pearly colour, and by means of which a person is enabled to detect them in the water. They are always on the alert to escape from their pursuer; when the water is but slightly agitated they dive from the surface, and in a few minutes, when it becomes still, they may be seen ascending slowly, but rarely using the antennæ. I could only obtain specimens by including them in a large quantity of water taken up suddenly, from which they could be separated subsequently by straining through a calico bag. A bucketful (two gallons) of water often produced twenty to thirty individuals, and sometimes twice that number. They never survived a single night, even though kept in their native element in a vessel. From their constant darting from side to side of the vessel, perhaps it is a safe inference, that the fear of danger in their new situation may be one of the chief causes of the early extinction of life.

May 24th.—The ice, which had been turned up during the recent pressure, was observed to have a number of small cavities, from two to six inches deep, on its under surface. Each cavity contained a greenish

slimy-looking substance, which, after two or three days' exposure to the air, gave out a fetid smell. It did not present any definite form of structure to the naked eye, or even to a pocket lens; but there is little doubt that a good microscope would have discovered its composition to be a mass of infusory animalcules, and miscroscopic vegetable forms; in all probability, *Polygastrica* and *Diatomaceæ*, and perhaps, also, *Confervæ*. The vital action going on in such masses, in close contact with the under surface of the ice, would maintain a temperature a little above the surrounding medium, which would easily produce the small cavities that attracted our notice. I do not confound these depressions with the innumerable perforations in honeycombed or rotten ice. The surface of each of these was quite smooth, whereas in rotten ice, or ice pitted on the surface from the action of the water alone, it is peculiarly rough.

Towards evening, the ice began to slacken more decidedly than it had done yesterday. Large hummocks could be seen descending to their usual level in the water, and our attention was frequently arrested by large masses coming up from beneath the ship's bottom. The whole "pack" was setting down the Strait and out of the Bay; and for a short time there were fears we should drift along with it. As the ships were carried in the direction of the iceberg

which followed so hard after them, and had almost destroyed them but a few days before, a whale line was run out to it, by means of which they were drawn in towards it, amongst the slackest of the drifting ice. Extensive floes out of the land ice began to come down, drifting before a strong north-easterly wind, which came on about nine o'clock, and, as some of them had to pass close by the iceberg, our difficulties in securing the ships to it were very much increased. Four or five warps were often necessary; and it was a very common thing to see two or three of the ice-anchors losing their hold at the same time.

May 25th.—The large floes, that drifted past the ice, were beginning to have narrow lanes of water between them; and as we had succeeded in clinging to it, hopes were entertained that it would soon bring us into open water. At one o'clock in the morning, there appeared to be sufficient room, amongst the ice, to enable us to ply the ships to the northward; and, accordingly, they were cast loose from the berg, and as much sail set as they could well bear with a strong breeze. Some of the lanes, between the floes, were rather narrow; consequently, a little difficulty was experienced in putting the ships about. On one occasion, while the "Lady Franklin" was thus engaged ahead of the "Sophia" in a very narrow

lane, she made what seamen call a "stern-board' into the ice, and carried away a great part of the rudder. The portion that remained, acting with the "head sails," was sufficient to steer with until the land ice was reached, where we were forced to remain until a new rudder should be got ready. The wind blew keenly from N. E. during the whole day; and although, in consequence of the disaster of our fair consort, we could not take advantage of it, it was doing much good by opening out the ice in the direction which we would soon follow.

In the evening the wind moderated, and ultimately veered round to about S. W. This was rather discouraging; but we expected it would return very soon to N. or N. E., from the indications of the barometer.

The four carpenters and the blacksmith were busily engaged during the whole day; and, although their work was rather tedious from so many bolts and fittings, they were making great progress. At nine o'clock in the evening the carpenters had advanced so far, that they were able to remove their work from the floe alongside to the deck, where it could be finished with every facility. While this was going on, both ships were cast loose, and the "Sophia," contrary to the usual custom, took the "lead;" and, as the wind happened to be pretty well aft, with a

check-rope to the "Lady Franklin" to prevent her from rounding to, we got on very well.

Towards midnight the sky became overcast, and there was a slight fall of soft snow. The wind died away for a short time, but before three o'clock the following morning it freshened up from N.E., and gave promises of a fresh breeze, which would hurry us along very rapidly.

May 26th, Sunday.—The new rudder was ready at one o'clock in the morning; and, after some trouble, it was found to answer rather better than the one that had been destroyed. The "Lady Franklin" then resumed her advanced position as leader, for which, on account of her many good qualities, she was so well adapted.

As we kept close along the land ice, which was not above a few miles in breadth, off Cape Cranstoun, we observed that icebergs, of not very large size, were very numerous. They appeared to be planted together as closely as possible all along the face of the land leading south from Cape Cranstoun. This was not owing to anything peculiar to one season more than another, for the whalers have designated the locality Berg Bay, from the numbers of icebergs which are always present in it.

At noon the latitude and longitude were obtained

by observation and found to be 71° 35′ and 55° 45′. The sky opened out to our view, for it was densely overcast in the early part of the day, and large white clouds were drifting rapidly before the wind. The ships staggered under a press of sail, as we plied to the northward, in open water between the land ice and the close "pack," which by this time had drifted so far off at the Black Hook, that it could hardly be seen from the crow's nest, when the ship was put about, close in with the land. The "Lady Franklin" had to shorten sail to wait for the "Sophia," which, "poor wee thing," was doing her best in a "short cross" sea, that had got up since the open water had become so extensive. The wind sweeping across the rugged land, and from the bleak glacier beyond it, made us feel very cold: while showers of sea spray were continually falling upon and around us. The jackets and clothes of the poor sailors were completely soaked with sea-water and frozen, so that they retained the shape of the human body after they had been put off. The deck was so encrusted with ice (from sea-water) that to walk or stand upon it with safety was quite impossible; and when the ship leaned over before the gale, her masts bending like reeds, it was very common to see half a dozen poor fellows sprawling in

the lee scuppers, and collecting their scattered arms and legs the best way they could.

Endless flocks of loons were seen in rapid flight to the northward, keeping close along the ice and the water, and appearing to prefer the piercing wind which was right against them. It is generally believed that the loon prefers flying against the wind to flying with it, and it is a well-known fact that if they are chased in the water by a boat before the wind, they never endeavour to escape by flight, but always dive, for the reason that they cannot rise from the water when there is much wind, unless they go against it. In the meantime we looked upon it as a favourable sign, to observe such vast numbers pioneering us into the far north; for it is an indisputable fact, that these and other sea-fowl never fly but where open water is to be found.

Towards six o'clock in the evening the sea became so rough, that the "Sophia" would not stay; consequently, she had to be worn round: which was to be regretted very much, for in so doing a considerable space was lost each time, and the boats had to be hoisted up as high as possible, and secured with great care. It was a very common thing to see her lee waist boat touching the water, and her bulwark nearly wholly immersed in the waves, as she dashed gallantly along heedless of herself, and many times

sending the spray over the foreyard, while her bow was completely encased in ice, and every rope and chain about it was ornamented with elaborate fringes of Nature's own workmanship.

May 27th.—The wind still continued to favour us, and, although it moderated a little towards morning, about noon it was as violent as ever. The sea, however, was not so rough, for we had by this time found the close pack in the offing, leading in towards the land, which narrowed the water very much, and ultimately closed it up altogether, so that at times our ships had to wait patiently until this floe and that patch drifted out of their way.

In the evening the wind began to moderate decidedly, and the sky assumed appearances which indicated that the northerly wind had nearly exhausted itself for a time. The barometer rose gradually during the gale, reaching the maximum height, at the time of its greatest violence; but now it began to fall, while the wind became more easterly, and large white clouds were spread over all the sky. Dark Head, in latitude 72° 15′, was seen very plainly to the eastward; and as far as could be judged from the crow's nest, we had no reason to expect that we should be stopped by the ice, although now and then it was perhaps closer than we could have desired. After one long

detention in North-east Bay, and the gale of yesterday and to-day, when circumstances were putting on a more agreeable aspect, we had reasons to be cheerful, and we were grateful.

May 28th. — At two or three o'clock in the evening we came to a decided and impenetrable barrier of ice, to the westward of a long and flat island about twelve miles north of Dark Head. The barrier was impenetrable, and gave no hopes of being removed by the ordinary influence of the tides, for it was composed of loose drifting ice, which would all move in a body before wind or tide, and a ship beset in it would require to move passively and helplessly along with it. It was very plain that a passage could not be made very easily on the outside of the island, and it was equally plain that it might be no easier between it and the adjacent land or island: however, as the wind threatened to come from about S. W., or some such disagreeable and unfavourable quarter, it was thought advisable by Captain Penny to take the inside, as it was probable that a weather side would be afforded, whichever way the wind came. The only objection to this course is the probability that the ships may encounter the rapid tides among the islands, and the consequent danger there is of being carried upon shoals or against icebergs in calm weather. There is another objection,

though it can hardly be put down as such,—viz. that the passage is made so much longer by taking this "detour," instead of going in nearly a straight line.

We had to retrace our steps so far, until the southern extremity of the island had a northerly bearing, after which we went east, and, when it had a tolerable westerly bearing, we made fast the ships to a small iceberg which was aground. In a few minutes it floated, and forced us to cast loose and look for more secure shelter. A second small iceberg, but larger than the last, was chosen, in what appeared to be a more favourable situation,—but it, too, proved unfaithful, and in less than half an hour it was chasing its neighbour, under the influence of the rapid tide.

After considering all the circumstances under which we were placed, the commanders of the Expedition concurred that the idea of going outside the island with safety, under almost any circumstances, should be given up, from the apparently advanced period of the season with respect to the condition of the ice. There seemed to be little danger of meeting with a solid floe, extending from island to island. In the course of a few hours both ships were made fast to land ice, within a quarter of a mile of a continuation of the coast north of Dark Head. The ice here was so much wasted that it was

highly dangerous to walk over it, and our ice-anchors required to be supported, by means of pieces of board laid crossways, lest they should pass through into the water.

May 29th. — Early in the morning the wind began to blow from S. or S.W.; the sky was overcast with a dense misty haze, which at times opened out so much as to resemble clouds. The position we had chosen was found to suit our purpose very well, but that we might be nearer the "nip," which kept us from advancing, we cast loose, and followed the margin of ice, we had just left, two or three miles farther along, until we were within half a mile of the "nip." Here the ships were made fast to the land ice again, and a large boat party was made up to go to the land, and also to ascertain what prospects we had of getting through.

Between the long flat island and the adjacent land, there was a great quantity of loose drifting ice, which, had there been no wind, the tide would have carried about in all directions. At the free edge of this ice, there were two smaller icebergs aground; and, stretching across from them to the land, in a lane of water about 300 yards broad, there were two or three small floes, jammed so tightly together, that even a boat could not get through between them. This was the nip, and, although not very mighty

looking, it was more than sufficient to retard our progress. A few of the party accompanied Captain Penny and Mr. Stewart to the floes, to see if anything could be done to set them adrift; and in a short time, they were seen quarrying among the smaller pieces, with handspikes and boat-hooks, and setting them free.

Several of the party ascended to an elevated position on the land, and had a very good view of the ice and the water to the northward. The nature of the rock is decidedly volcanic, for some of the specimens we found contained small empty cells; and it appears to be composed of upright but very irregular masses, which divide and decompose into pieces from three or four inches to a foot in diameter. In some parts, the characteristic appearance of a flight of steps is very well brought out; and, although cones and craters are altogether absent, the idea must not be discarded, that they were in active operation in that neighbourhood, at some time, when Greenland was submerged in the ocean. Large granite boulders were seen at various elevations; but I do not think that any person saw that rock protruding through the igneous rock, of which this part of the coast seemed to be entirely composed; hence, it might be safely averred, that they had been trans-

ported by ice, at the time when the land had been under water.

Vegetation, as yet, had hardly made any advance, although snow-buntings and ptarmigan (*Tetrao saliceti*, and *Tetrao rupestris*) could be seen occasionally. The ptarmigan feeds upon the willow tops, and the snow-bunting upon the berries of the *Empetrum nigrum*, which are very abundant. I landed six years ago on the rugged coast, south of the Black River, in the bottom of South-east Bay, and found these berries so numerous in the month of May, that whole baskets-ful could have been collected; and, although they had been covered with snow during the whole winter and spring, and were so far liable to change of temperature, they did not seem to have suffered much from it, for they retained their sweet taste, and other properties peculiar to them in a fresh condition. It is very probable that the temperature had rarely been above the freezing point; otherwise, decomposition of their juices would soon have rendered them quite tasteless.

I examined the crop of a ptarmigan which Captain Stewart shot, and found it crammed full of willow tops alone, for the leaves had not yet appeared. It is remarkable how the crop of the ptarmigan, which is not by any means highly vascular, can prepare such dry and apparently indigestible materials as in-

sipid willow tops, for the higher processes of digestion in the gizzard. The gizzard contained a few fragments of grit, and the horny membrane, which lines it, was actually tanned by the astringent principle of the food which it received. One or two sanderlings and sandpipers (*Calidris arenaria*, and *Tringa maritima*) were also seen on the land, and at the beach close to the water. Eider-ducks, king-ducks (*Anas spectabilis*), long-tailed ducks, loons, dovekies, brent geese (*Anser Bernicla*), red-throated divers (*Colymbus septentrionalis*), and burgomasters (*Larus glaucus*) were seen flying up and down along the land, in very great abundance.

The quarrying which Captain Penny and his party commenced among the ice, was attended by happy results, for they succeeded in setting free several large floes, which so much relieved the others, that there was no doubt, with good "purchases" and willing minds, we might be able to heave the ships through. Immediately after dinner, the ships were cast loose, and allowed to drop down before the wind to the "nip." An intricate turn or winding, which had to be passed, required the use of a line from the land to check the ship's bow, lest she should run into one of the icebergs. On the one hand, then, we had the rocks to avoid, and on the other the icebergs, either of which might do serious damage,

if we were brought into close contact with them, by a "coup de vent," which was very common. At length, we "heaved" the ships through, and sailed along the land, high and bold on the starboard, and with the ice on the larboard side, until we came abreast of a large opening running to the eastward, where we found the ice leading a little more to seaward, along the northern end of the flat island. After following the direction of the water, occasionally passing through streams and patches of very slack ice, which in many parts was in the last stage of decay, we came to a complete barrier of large floes, which the south wind had brought down against the land ice, to the westward of the Danish settlement at Proven; and as nothing better could be done, the ships were at once thrust in among them, with the expectation, that by dint of perseverance, with the capstans and windlasses, warping and heaving, we should ultimately reach the land ice, which could be seen very plainly about three miles due north.

May 30th. — Our most strenuous efforts to reach the fixed ice failed, for, when we were within three quarters of a mile of it, the loose ice became so close, that it was found impossible to advance a single foot; the weary crews were ordered to go to rest, with the exception of one or two persons, to report any motion among the ice.

A number of Esquimaux came off from the settlement, bringing with them a few sealskins, which they were willing to give in barter for cotton handkerchiefs and articles of clothing. Some of them were busily engaged capturing and cutting up a *Beluga*, which had become an easy prey to them, by a well directed shot from one of their rifles. It was all mutilated before I saw it. It appeared to be of the ordinary size; and its capacious stomach contained the skeletons of fishes in a very perfect state, which appeared to belong to the genus *Merlangus*, a genus very widely distributed over the Polar Seas. The aorta was thirty-three lines in diameter, and the sigmoid valves measured four inches at the free edge. The quantity of blood, which such a capacious and elastic tube is capable of transmitting, must be very great, in proportion to the size and weight of the animal. It is very probable, that the proportion of fluids to solids in the aquatic mammalia, is much greater than in any other red and warm-blooded animals; and I think we may infer with safety that this is the cause of putrefaction commencing so early, and going on so rapidly in them, as compared with all other animals. The ordinary black whale of Greenland, if it sink in the dying "flurry," will be buoyed to the surface in a few hours, by the rapid generation of gases in the intestines, and in every tissue through-

out its whole bulk, except the purely tendinous tissues; and before the expiration of two days, fully more than one-half of its enormous carcase will be above water. The ordinary small seal (*Phoca vitulina*) requires to be cut up immediately after it is killed, if it is to be used as food, otherwise it speedily becomes disagreeably tainted and unwholesome. I have no doubt the obstacle, which a thick layer of fat presents to rapid cooling, assists in stimulating the process of decomposition. But this will not assist materially; for were it so, land animals also, well protected by a thick layer of fat, ought to follow a similarly rapid process of decomposition after death. The teeth of the *Beluga*, eighteen in each jaw, are from half an inch to three quarters of an inch apart, half an inch in length (above the soft gum), smooth on the crown or point, and rounded off at the sides. There are no distinctive marks for molar, canine, and incisor teeth, except that the latter, two in number, are only three lines in length, in the lower jaw, while they are entirely absent in the upper, or placed so far apart, as to correspond with the opposite canine: the posterior molars are also a little shorter than the others. The axis of the teeth in the upper jaw is directed backwards, into the mouth, and that of the lower forwards; so that when both are approximated closely, an interlocking is observed, which, coupled

with the entire skeletons of fishes, found in the stomach, conveys the idea very forcibly, that the teeth are used only as instruments of prehension.

About three or four o'clock in the morning the wind came away from N. or N. 20° E., and the loose ice, in which our ships were beset, began to move slowly southward. The alarm was given by the Esquimaux on the fixed ice, at a distance of at least a mile, to their friends who were with us, that the ice was opening out: away they set, with dogs and sledges, in the utmost haste, — but it was too late, for there was a lane of water, at least two hundred or three hundred feet wide, between them and their companions on the other side. A large piece of substantial ice was singled out, on the very edge of the loose ice on which they were standing, and to it they transferred their dogs and sledges, with the flesh and skin of the white whale; after which they embarked and pushed off. What with men, boys, dogs, and sledges, it was a motley group; but they seemed to have no fear, although I believe not a soul could have been saved, had the ice given way underneath their feet. By the assistance of two small kyaks, which towed them heartily against the wind, they reached the opposite side in safety, disembarked with care, and joined their companions, who had waited for them with great patience. This occupied two

hours! While this was going on in one part, a different scene could be witnessed at no great distance in another. One of the Esquimaux, who had been to the ships with his sledge, and had secured a large share of the skin and flesh of the whale, returned with it to the fixed ice, where he left it under the care of his dogs and one of his companions, and came again to the ships. As soon as the first alarm was given of the ice shifting, he set off, and, being more active, and having less to burden him, than his neighbours, he succeeded in gaining the fixed ice, just in time to prevent one of his dogs breaking into the sledge. This he did by inflicting a blow which completely disabled the poor brute, and, knowing that it would not be able to assist the sledge to the land, he took off its harness, thinking it would run away home. From the violence of the injury which the poor thing had received, it was only able to go a short distance from the sledge, when it lay down upon the snow, yelping and howling most pitifully. The Esquimaux was joined by one of his companions, and both commenced exercising their skill and steadiness of aim, with their sharp-pointed spears. They paced their distances again and again, each time sending their spears into the least vital parts of the body of this dumb brute, which could not escape from them. I was glad

to see it tumble over with a spear sticking in its breast, so that it would feel no more pain in the service of such inhuman masters. I alluded to the treatment which the poor dog had received from its owner, in the presence of a great number of Esquimaux, and the explanation which they gave was, "that the two Esquimaux, whose recent conduct we had observed and deprecated so much, were not Christians, but were still uncivilised, living apart from the settlement at Proven, and not permitted to hold intercourse with them or the other Esquimaux, except in the most distant manner." Having discovered that the whole affair had come to Captain Penny's ears, the two delinquents withdrew from the ships, lest they should feel his threatened vengeance and indignation.

Wherever the ice had been very much decayed, a dirty brownish, slimy substance was observed, floating in loose *flocculi* amongst it, in the surface of the water. The naked eye could detect in it no structure whatever; but on viewing a drop of it through a microscope which magnified about two hundred and fifty diameters, it was found teeming with animal life, and minute vegetable forms of very great beauty. Now would have been the time to perpetuate them with the pencil and the chalk; but unfortunately I could only consign them to the bottle, with the ex-

pectation that their delicate siliceous shells would retain their forms until our arrival in England. No one can conceive the vast numbers of these infusorial animalcules in the Polar Seas. Varying in size from $\frac{1}{300}$ to $\frac{1}{1000}$ of an inch, a single cubic inch will contain perhaps four or five hundred millions of individuals, each furnished with perfect instruments of progression. In some of them I could see the cilia in rapid motion, while, to use the words of Professor Jones, "they were swimming about with great activity, avoiding each other as they passed in their rapid dance, and evidently directing their motions with wonderful precision and accuracy."* In others, no cilia could be detected: but as they, too, were seen in motion, although not so often as the others, there is no doubt that they also possess similar delicately-constituted organs. A beautiful sieve-like *Diatoma* was very abundant; but the shells which are siliceous were broken very readily. They resemble the *Coscinodiscus minor* of Kutzing. †

I do not think that these infusoria can be included in the forms of animal life, described by Captain Scoresby, under the comprehensive genus *Medusa*,

* A General Outline of the Animal Kingdom, by T. R. Jones, F.Z.S., 1841.

† Kutzing on the Diatomaceæ, p. 131., Table I., *figs.* x. xi. and xii.

which is very abundant in the Greenland Seas visited by that most distinguished Arctic voyager; nor does there appear to be the slightest resemblance between them, except that both are of very minute size. He says that the sea is sometimes of an olive-green or grass-green colour. This is not at all peculiar to the still bays in Davis Strait, where the infusoria are so abundant. This phenomenon applies to the sea generally, for many leagues, or even degrees, and is not confined to the surface only; neither is it essential to that condition that there be ice. In Davis Strait, the infusoria are generally found most abundant where there is ice, never extending above a few inches, at most a foot, beneath the water; and when the ice disappears for the season, the brown slimy substance is rolled into rounded pellicles, by the rippling of the water, retires from the surface, and ultimately sinks completely out of view, having never tinged the water in the slightest degree, except when it gave the decaying ice a dirty appearance. It is a well known fact, however, that *Entomostraca, Acalephæ*, and *Pteropodous mollusca*, in great abundance and of various sizes, from $\frac{1}{30}$ or $\frac{1}{40}$ of an inch in diameter up to half a foot or more, cannot fail to change the colour of the sea in a remarkable manner.

At eight o'clock in the morning all the crew was called, to make an attempt to extricate the ship from

the drifting ice. A similar attempt on board the "Lady Franklin" proved quite successful, for she got clear of the pack about noon, but the Sophia, "poor thing," being a little astern, was carried away to leeward, until the pack was brought to a stand on the north end of the long flat island. I can bear testimony to the exertions made by her crew, under the able guidance of her commander, Mr. Stewart, and that of her mate, Mr. Manson, to free her from the ice. About midnight, after sixteen hours of almost uninterrupted heaving, warping, and towing, we got clear, and having plied up to the weather ice, for the wind was still northerly, we made fast within a few yards of the other ship, which could not advance to the northward, owing to the closeness of the pack to the land between the settlement of Proven and Saunderson's Hope.

We learned that Captain Penny and some of the officers of the "Lady Franklin" had been at the settlement, which I believe was eight or ten miles distance to the eastward. Captain Penny had seen the sub-governor (Proven being but a branch settlement), and had made enquiries about the missing ships, including the "North Star," which last we were looking for in the pack in the middle of the Strait. All his enquiries were answered in the negative; some of the Esquimaux indeed had never

heard of the missing expedition: but, like their neighbours at Niakoranak, they expressed great sympathy for the lost men of whom we were in search. The Esquimaux came off to us a second time, it being much easier to do so now than it was the first time, owing to a continuation of land ice from the settlement to the ships. The poor creatures deserved nothing but kindness at our hands, and I hope they obtained it; although at times we endeavoured to strike a hard bargain for boots or mits, which they made for us by the sanction of the governor.

May 31*st.*—Early in the morning the sky was beautifully clear, and the wind was from about north, and although it was not very pithy in its effects upon the ice, we had no doubt it would not fail in the end to make a passage for us along the land. We occupied a position in which we were sure of being safe, and of getting away with the first shift of wind, if it did not come from W. S. W. or N. W. Towards mid-day and evening the sky became overcast, and there was a light shower of flaky snow; but it only continued for a short time, when it cleared almost entirely from the sky. During the greatest part of the day, there were long streaky clouds settled above and on the northern horizon. The temperature of the air ranged from +23° to +33°, and that of the water, +29° to +30°. The appearance of the sky

and the high state of the barometer afforded pleasing indications of favourable weather.

While we waited here, I had an opportunity of examining with the microscope a brown slimy substance, which was seen coming from underneath the fixed ice with the receding tide. As the free edge of the ice was very irregular from pressure and decay, any substance floating in the surface of the water would necessarily be entangled and detained, if its cohesion were sufficient to resist the force of the water. This could be seen very plainly with every tide, and the shreds and wavy ribands of the brown slime were frequently mistaken for seaweed (*Laminaria saccharina*), many feet in length, which under those circumstances it so much resembled. In addition to minute siliceous animal forms, and also vegetable organisms which could only be discovered by a high magnifying power, this contained a beautiful moniliform siliceous alga, about $\frac{1}{300}$ of an inch in diameter, of which the articulations are one and a quarter times as long as broad, containing green granular matter, which imparts to the whole plant its colour, when examined microscopically.

From Swartehuk to Proven the coast presents the same appearance as the Island of Disco; here and there abruptly terminating conical eminences with what, at the distance we were, appeared very much

to resemble a flight of steps. From Proven to Saunderson's Hope, and thence much farther north, the coast is almost altogether composed of plutonic and metamorphic rocks; volcanic rocks, however, may be seen occasionally protruding through, and overlying, the granite and gneiss.

Captain Penny endeavoured to secure the services of two Esquimaux for our Expedition; but all the inducements, he could hold out, completely failed to prevail upon any of those home-sick people, to leave their "firesides." An active young lad volunteered his services, upon condition that his mother's consent should be obtained. As this was a condition very unlikely to be granted, I think the lad merely came forward to wipe off the odium, which he began to think would attach to his people for appearing to be so cowardly. There were many at Proven who could have been spared much better than this young man, who was the only support of his mother. They avoided all kinds of conversation, that might beguile them in an unguarded moment into the idea, that, by accompanying our Expedition, their condition would be ameliorated; and if it were intruded upon them, the conversation was always sure to become unintelligible and unpleasant. Fear on the one hand, and love of home on the other, seemed to be the chief agents which stood between us and them.

June 1*st.* — The weather became very mild, and the northerly wind died away; the ice began to slacken by the influence of the tide, and to open out, leaving space for us to proceed to the northward in the direction of Saunderson's Hope, along the edge of the land-ice. The ships were cast loose, and tracked along; and, as about two dozen Esquimaux could be seen at the rope, along with our respective crews, we went on rapidly. They did not continue long with us, and in the course of the afternoon we were again alone, closely beset at the land-ice. Towards midnight the weather became quite thick, and there was a slight fall of soft snow; and, what was very remarkable, each flake, as it fell on any part of the ship, was dissolved by the heat, which that on which it fell imparted to it. The ice began to slacken, and, after heaving and working for two or three hours, the ships were again in open water leading north; but, as the weather happened to be thick, and fearing that we might enter the loose pack, they were made fast to a small extension of land-ice in the vicinity of a small rocky island. Loons were very abundant, and they were observed to be much more easily approached now than they were three weeks ago. This is always the case with these birds; and, I believe, it is owing to their peculiar habits immediately before they betake them-

selves to the perpendicular cliffs, where they bring out their young.

June 2d. — As morning passed away, the thick weather and the snow disappeared, and about mid-day the heat was most intense. We found that our position was in the immediate neighbourhood of an almost perpendicular cliff, rising to a height of at least four hundred feet, and fully exposed to the sun during nine hours of his greatest altitude. This fact accounts for the high maximum temperature, which was registered at three o'clock in the evening. The ice at the foot of such cliffs must dissolve very easily, both by the heat which it receives directly from the brilliant sun, and indirectly by reflection and radiation from the cliffs. In the evening we found that a small barrier of ice intervened between us and a large "water," which could be seen from the "crow's nest," and, after towing and tracking for four hours with both crews, the ships were again brought to a stand. Towards night — for night we always termed it when the sun was low, although not out of sight—the sky again became overcast, and there was a little snow; but it was dry, and not flaky; a gentle breeze sprung up from a little to the eastward of north, which opened out the ice, and in a very short time our sails, widely spread, could be seen gladly inviting the kindly wind which carried

us in a few hours clear of the ice, and in the direction of Saunderson's Hope. It made no difference to the commanders, whether all hands were out or not, for if the ships were under sail, and there happened to be the slightest chance of coming in among ice, night or day, fatigued or refreshed, it behoved them to be at their post, and they were at it. The amount of fatigue, which habit will enable a person to endure, is remarkable. A very ordinary "spell" for the whaler is two or three successive days and nights without any rest, and sometimes even a longer period.

June 3d.—At ten o'clock, when we were within a few miles of Saunderson's Hope, an Esquimaux came alongside in his kyak, and, after a little trouble, he succeeded in getting on board. He came from the settlement at Uppernavik, having heard that two ships were coming up from the southward, which were "not whaling ships." He informed us that no ships had passed the settlement to the northward this season, and that none had been seen since the whalers and the Danish ships had left it last season; and, in reply to our questions respecting water, he said there had been a large space of open water off the settlement, and to the northward of it, for a considerable time, at least for two or three weeks. It was really to be regretted, as we came along, that the

land ice was in a manner disappearing before us, thereby increasing our labours and retarding our progress more than any person can conceive who has not experienced it.

About noon we passed between two islands, and as the evening advanced it fell calm, and it was necessary to go a head with the boats to tow: this proved very irksome work, for it occupied eight or nine hours to tow from Saunderson's Hope to the settlement, although the distance is not above ten or twelve miles. Thousands of loons could be seen flying in the face of the cliffs, as we passed close to them, and a boat, which had been sent from the "Lady Franklin," shot four or five dozen in a couple of hours. It was very easy to shoot them dead in the shelves of the cliffs; but it was for the most part impossible to get them by climbing, so that they were lost, unless they fell into the water in their dying struggles. The season for the eggs had not yet arrived, otherwise Saunderson's Hope could have afforded an abundant supply. The Esquimaux and the Danish settlers, and also the whalers, rob the loons in their secure retreats, by descending on a rope from the top, where it is either fastened to a large fragment of rock, or is held securely by two or three men. Several boats' cargoes of eggs are removed in this manner every season, without appear-

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ing in the slightest degree to diminish the number of birds which lay them.

In the evening we arrived at the settlement about eight o'clock, and moored the ships to a small iceberg, which happened to be aground within half a mile of the land.

CHAP. IV.

FROM UPPERNAVIK TO KINGATORSOAK.

Engage Mr. Petersen as an Interpreter. — Uppernavik. — The Resources of the Settlements. — Loss of two Danish Ships. — Visits to the Settlements. — The Intelligence of the Natives. — Effects of Civilisation. — Diseases incident to the Natives. — Not addicted to bad Habits. — Insanity. — Habits. — Success of the Settlers. — Lutheran Missionaries. — Disease incident to the Settlers. — Anti-scorbutics. — Character of Rocks. — Plumbago. — Deep Fiords. — Rapid Tides. — Dangerous Sledging. — Land-Ice disappearing. — Bad Prospects. — Season too far advanced. — Leave Uppernavit. — Kingatorsoak. — Mr. Petersen and Thomas. — Ptarmigan shot. — Conveying Power of Ice. — Extraneous Bodies on Glaciers and Icebergs. — Snow-Blindness. — Small Islands the breeding-Places of Eider Ducks. — Dangerous Navigation.

June 5th. — Immediately on our arrival at the settlement, Captain Penny went on shore, to enter into arrangements with Mr. Flasheur, the governor, with respect to interpreters, whom he was very anxious to employ. Two Esquimaux and a Dane would prove very useful to our Expedition, from the experience which they have in travelling over ice with dogs and sledges. They would also be useful in assisting

and teaching our men to capture seals on the ice; a process which, in consequence of the extreme wariness of these animals, requires very great care; so much so, indeed, that it is a very rare thing for the whalers to shoot them dead at their holes on the ice.

All the Esquimaux at the settlement soon learned that the services of two of their number were required, and that high inducements were held out to them, to come forward and volunteer in the search for lost "white men." High wages *, a comfortable home on board ship, new acquaintances, the chances of finding wild Esquimaux, and of seeing new lands, and covered with ice too, so genial to his feelings, to say nothing of the high claims of humanity,—all these the home-sick Esquimaux of Greenland would not receive, in exchange for his enjoyments on his native soil. With his wife and children all huddled around him in his oily and dirty hut, his church and priest, governor and faithful foreman, he is happy and he is free. All, that we could say, completely failed to persuade any of them, to accept our invitations to cast their lot in with ours for even twelve

* Thirty shillings per month would be high wages for an Esquimaux, whose living costs so little, and who is content to live from day to day without making any provision for casualties, which may throw him entirely upon the charity of his friends.

months, which would soon pass away. One of them said, what he knew to be true, "that the strength of our ships, which we trusted to, would no more stand violent pressure among the ice than his kyak, and on that account he declined accompanying us." Another exposed his fear equally well, by saying "that after going far away from the settlements, surrounded on all sides by ice, where there would be no seals, our provisions would be exhausted, and what then should we do?" We had abundant proofs that fear of danger, as much as the endearing charms of their native soil, was a decided obstacle in our way.

One of the Danes (Mr. Petersen), who acted in the capacity of assistant governor under Mr. Flasheur, had a proposal made to him by Captain Penny to accompany us. This he accepted, after due consideration and consultation with his wife, who, although almost a pure Esquimaux, is a very sensible person, and very useful in the settlement. He said he would be ready to sail with us in twenty-four hours. It was rather trying for him to leave his wife and two children; but as he had every confidence in his kind friends the Governor and the Rev. Mr. Mossen, the priest, his anxiety for them was considerably diminished. He left thirty shillings,

or twelve dollars, per month for their use, with power to obtain a larger sum, if they should require it. His wages in the Expedition were settled at six pounds per lunar month, or seventy-eight pounds for the year; and a promise was made to him, that the interest of the Admiralty and of the Government of Great Britain, with the Directors of the Company whose service he was about to leave, should be solicited, in his behalf, before and after our return to England. It was understood that he was to bring a few dogs and his sledges with him, and this he seemed very willing to do. Indeed, it may be said of him, that the search for Sir J. Franklin appeared to interest him very deeply; and when circumstances opposed what, we thought, tended to throw any light upon his fate, Mr. Petersen felt the disappointment fully as poignantly as any person in the Expedition.

The settlement at Uppernavik is among the best in Greenland, although it is the farthest north. The income of the Governor, which is almost entirely dependent upon the annual produce of oil and furs, amounts to from three to four or five hundred pounds sterling. The natives and the settlers bring to him the seals and white whales they capture at a fixed price, which is generally paid in goods, such as coffee, sugar, biscuit, rye-bread, and other necessaries, which can only be obtained through him. The produce of

the settlements is removed every year to Denmark, in the Danish ships which bring out regular supplies of everything the settlers may require; but if accident should befal any of the ships, there is generally the loss of one year's produce, as there is not a sufficiency of casks provided to receive two years' produce. Two of the outward bound ships, laden with provisions, coals, and other necessaries, were lost in one season by running into icebergs. The crews were saved by getting into their boats, and making for the settlements; but nothing of the cargo was saved, and, as might be expected, the settlements, which depended upon them, were deprived of their supplies. The Danes, in such cases, would be reduced to a state little better than the Esquimaux themselves, were it not for a quantity of provisions over and above one year's allowance, which can be made available, but which is quite inadequate to supply their wants without making very great demands upon the resources of the country around them. I have heard a clergyman who had been six years in Greenland, say that he had to content himself with less than half allowance of bread, during the greater part of winter and spring. It does not necessarily follow that there is famine with its concomitant diseases, in consequence of these disasters; but it invariably happens that privations,

otherwise unknown, have to be endured; and the unfortunate settlement or settlements are reduced by such events so much, that their ill effects are felt for two or three years afterwards.

I frequently visited the settlement, and saw a little of the Esquimaux on several occasions. Some of the chubby little boys would follow two or three of us, to the top of a hill over the settlement. It was gratifying to hear their readiness in naming, when asked, any rock, stone, plant, or animal, that could be seen. There is hardly a natural object which comes under their notice but they know its history. Sun, moon, stars and sky, earth, land, water, and the animals which inhabit them, afford the civilised Esquimaux of Greenland useful and pleasing studies. Doubtless, much of what they say must be purely legendary; but they are not the less interesting on that account. Their practical knowledge of the weather, and their associations of good and bad weather with corresponding meteorological appearances, of the currents of the sea in various seasons of the year, of the formation of ice and the descent of glaciers, of the habits and resorts of animals on which they depend for their subsistence, and, above all, the ingenuity which they display in accomplishing, by exceedingly simple means, many things which to us appear very complicated, are more than enough to

convince us that they possess a large share of intellectual endowments. The inhabitants of Uppernavik and of Greenland, generally at all the settlements, present the unexceptionable and characteristic features of their aboriginals. Intermarriages with the Danish settlers have changed the appearances of some, but not nearly so much as one might expect. It is very common to see the Mongolian character predominating largely in a person, who has no connexion with that race except through his grandmother.

There is a very striking contrast to be observed among them; although physically the Esquimaux will not receive the stamp of race peculiar to the Dane, and put on his white skin and silken hair, yet he at once embraces his faith, and becomes a supporter of his creed, and a worshipper of his God. From the 60th parallel of latitude up to the 73d, which is nearly the latitude of Uppernavik, extending over nearly eight hundred miles of coast, you will meet with settlements, which have been established for more than a century, and where the neat little church, with a cross over its western door, has been weathering the Boreal blast during a much longer period. You will see inscriptions and dates in the burying-places, of individuals who had been born and baptised, who had lived to a good old age on

their native soil, and who had died fifty years ago, full of hope in Him, whom the Lutheran missionaries from Denmark had taught them to believe, and led them to worship. There is not one, out of twenty, who does not conform in every particular to the teaching of the priests. It is not easy to make them change their dirty and indolent habits, for they like to wallow in filth and oil, and not to be over anxious about the future. It appears, as if this were a significant habit, which perpetuates the memory of the noble stock of "Innuit," to which they are proud to belong.

The natives are not subject to many diseases; inflammatory affections of the eyes are the most common, especially among old people, and, next to these, affections of the mucous passages, especially of the lungs, which generally occur twice every year, spring and autumn, and not unfrequently prove fatal to children and old people.

They seem to be addicted to very few bad habits. Smoking and chewing tobacco are commonly practised by the Danes, but the Esquimaux do not appear to have become slaves to either. Some of them, however, are great snuff takers. One female was so passionately fond of snuff, that she would sit a whole day with a small mortar and pestle, triturating the dried leaves, for the sake of her favourite luxury.

Some of them would be fond of ardent spirits if they could obtain it. I fear they owe this taste to their intercourse with shipping, both English and Danish, but chiefly to the former, who give them spirits out of a feeling of extreme, but certainly very mistaken, kindness, as it proves so hurtful to those who partake of them. Insanity is not uncommon, but it is difficult to ascertain in what proportion.

A young man, who had flattered himself, that he would prevail upon his cousin to marry him, was so much disappointed by her refusal, that he committed suicide.

A whole family, who had been led away for a short time from the Lutheran Church, by a person, who professed belief in the sorcery of the wild Innuit, very soon became so startled and horrified at the enormity of their crime, that they resolved upon escaping instantly to some of the settlements, where they would be safe with the priests. Their dogs and sledges were immediately prepared, and they drove away so hurriedly, that when a fine lad of ten or twelve years of age fell off the sledge, they either cared not, or were afraid to wait, to pick him up; in consequence of which he perished. They soon recovered from their partial insanity under the kindly treatment of the Danes. The boy, whom they had lost, was eagerly sought for by the Danes; but

it was in vain. His body, however, was found the following spring, but much mutilated by ravens, which could be seen hovering over it before it was found.

They treat the insane very badly: one or two they have buried alive; others they neglect altogether, if they are not outrageous; and frequently coercion is used. One poor woman lost a hand from the tightness of the cords. It is not many years since a young man, in a state of insanity, was removed to a distance from one of the settlements and buried alive. The Danes made inquiries for this person, whom they had often seen; but their most earnest entreaties to know where he had been put, accompanied by promises of reward, met with a deaf ear from the obstinate Esquimaux, until they were sure that the victim of their superstitious notions could not be alive. They believe in the power of keeping up intercourse with invisible agents, by which they possess the means of attacking persons whom they wish to injure. A violent attack of inflammation of the eyes, ending in total blindness, was attributed by the afflicted son, to the intercourse which he believed his father, a poor old man, had with evil spirits; and he wished his sight restored for one particular reason,—that he might kill his aged parent for doing such a bad thing. His only reason for

supposing that his father had been the cause of his loss of sight was a report conveyed to him, as a profound secret, that he had been observed doing something to the eyes of a dead dog that was lying in a pool of stagnant water. This species of necromancy is called "Illecectooke," and those who are so unfortunate as to possess it, and to be discovered doing harm by its means, are murdered by the injured persons or their relations. As soon as the popular clamour is raised against one of their tribe, his doom is sealed, and he has to bow to his fate, without the chances of mercy which he might expect from the severest despotism.

The propensity, which they have to kill every creature which comes within their reach, is very remarkable. The fond mother sits with her little son or daughter on her knees, controlling the little hands, and snapping every intruding fly that comes near them. There is always a day of feasting when, for the first time, the passive hands of the unconscious infant have deprived some unfortunate creature of life; and there is much talking and merry-making among a whole tribe, while, doubtless, the destinies of the helpless child are fully discussed and prophetically explained. When the boy leaves his mother's side, and appears among the dogs, he treats them all without favour, and their

poor ribs soon discover his increasing strength. He hurls stones, with insatiable cruelty, at the little "snow-bunting," the "lark" (*Alauda alpestris?*), and the "redpole" (*Fringilla minor?*); and if he happen to return to the hut, from one of his frequent excursions, with a ptarmigan, a hare, or, better still, with a seal, there is again a day of universal rejoicing. The whole neighbourhood is assembled, to partake of the feast which the good fortune of the young and promising sportsman has afforded; and ten to one but a "match" is bespoken for him, before the party breaks up.

Each of the settlements has generally four wooden houses, in which the priest, the governor, and subgovernor, and their servants reside. They are well furnished; and when one is ushered into the neat little parlour, after being in the huts of the natives,—when he looks out at the neat little window, with its clean curtain and painted sash, upon the ice and the icebergs, upon the sea and the rugged land, and upon the Esquimaux pursuing his daily avocation with his spear, gun, and kyak, a contrast is discovered, which makes him feel, that the European is from home. Let him look a little longer, and in other directions, and he will discover the church, with its neat paling and open door, telling him, that they are not from home, who live in its neighbourhood.

The priests are sent out to them by the government of Denmark, and the governors by the directors of the Company, through whom only promotions and appointments can take place. The form of religion, established in Denmark, is also established in Greenland, although of late years two or more Herrnhutians (better known as Moravian missionaries) settled in South Greenland, and commenced their labours, where the followers of Egede had been busily, earnestly, and most successfully engaged for upwards of one hundred and thirty years. At present they are not encouraged, having to pay passage fare, to or from the settlements, in the ships; nor are they permitted to settle to the northward of the Arctic Circle. It is very probable, however, that in a few years they will be permitted to visit or settle in any part of West Greenland, from Cape Farewell to Cape York, without opposition from directors or government.

It would be very interesting to ascertain the effects produced on the minds of the Danes, by repeated winters, spent in the Arctic Regions among the Esquimaux, when they have so few with whom to hold such intercourse as may destroy the *ennui*, which is sure to creep in among them during the absence of the sun.

They are not subject to many diseases, at least to

epidemics; but, like the natives, in spring and autumn, the seasons for changeable weather, they become affected with rather severe colds and bronchitis, which, however, hardly ever prove fatal to grown-up persons. Scurvy is sometimes, but rarely, met with; in which case it is generally removed by a return to fresh food, as winter passes away. The skin of the white whale or of the narwhal is highly prized as an antiscorbutic; but unfortunately it cannot be obtained, when its use is most necessary; hence, recourse must be had to preserving it in a boiled state in vinegar. A plant (*Pyrola media?*), known by the name "bukoblather" among the Danes, which is very abundant, is also very highly prized as an antiscorbutic; and when they have any fears of the approach of scurvy, it is collected in basketsful, and a decoction or infusion made from it comes into general use.

There were a great many dogs to be seen prowling about the huts; but none of them ever threatened to attack us, when we attempted to enter the habitations of their owners. It was not unusual to be followed by three or four dogs, as well as boys, as if they, too, were anxious to know what we were doing on the soil, which was sacred to them alone.

Vegetation was beginning to spring beautifully. The Saxifrages, with the *S. oppositifolia* at their

head, were in the most advanced state; next to them the Cerastium and the Willow, and, perhaps, among the latest of all, the Poppy (*Papaver nudicaule*) and the Scurvy-grass (*Cochlearia officinalis*) might be included. The settlement is upon an island which is composed of plutonic and metamorphic rocks. In its immediate vicinity, plumbago of tolerable purity is rather abundant. I believe the whalers were the first to discover it, and to bring some of it to Britain. It was found of considerable value in the market, and might have been a source of profit to persons who sent out ships for cargoes of it, had not the directors and the Danish government sent out orders to their representatives in Greenland, to prohibit all British ships taking any of it away.

Immediately to the eastward of Uppernavik, there is a deep fiord, which runs tortuously to the eastward until it reaches the glacier, whence it receives hundreds of huge icebergs every season, and affords a passage to them into Davis Strait. Mr. Petersen says the rapidity of the tides in it is so great at one part, that there is open water during the whole winter, even after the lowest temperature for the season has been registered. He says that the same feature obtains, in other parts of the Strait, where the tide runs very rapidly. In the neighbourhood of Saunderson's Hope, where the water is deep

and the tide runs fast, the ice is weak in February, and sometimes it hardly closes up altogether; so that sledging becomes dangerous. On one occasion he had to cross ice which was so weak, that, had the dogs come to a stand, they must have all sunk through it. At another time, one of the runners of the sledge sunk through it, and the dogs came to a dead stand, on a piece of ice a little stronger than where the sledge was. He had to crawl along, not on "all fours," but as widely spread upon the ice as he could well be; while every moment he was in imminent danger of passing through into the rapid tide, which would instantly have swept him below the ice never to be seen. Fortunately, however, he succeeded in getting his sledge out and righted, and ere long his dogs were carrying him over the rotten ice at a galloping rate.

During the whole of yesterday the weather was clear, so that we could command a fine view of the strait, both to the offing and the northward, on the outside of a great number of islands. The ice appeared to be much dissolved, and it was reduced to a state of "pack" close in with the islands; but it still covered the water, in such a manner as to retard navigation, as much as if it had been one continuous sheet. This will appear rather strange; I must therefore endeavour to make it clear

from what has come under my own observation, which, of course, is but limited compared with the observations made by those persons who have been "half their days among the ice." In 1845, the whaler in which I happened to be engaged, arrived at Uppernavik on the 1st of June, having passed between floes several miles in superficial extent, which were planted along the edge of a great breadth of land ice, extending from the Black Hook to Saunderson's Hope; and, after endeavouring to get as near the settlement as possible, we found that nearly two miles of fixed ice still remained, where it had formed on the water. On viewing the strait to the northward, from the top of the hill over the settlement, the "pack" could be seen in the offing as usual, but the bays and fiords either contained the ice fixed from side to side or large floes, which were not subject to be moved several miles with every tide. A smart breeze came off the land, and, having remained at Uppernavik but twenty-four hours, we set sail to the northward on the 3rd, and, after crossing Melville Bay, we arrived on the west side of the strait on the twenty-fifth. The ice along the land, for the most part, presented one continuous sheet, which extended in nearly all cases to the outside of the islands most distant from the coast, and when a favourable wind came, no matter how light it might

be, it always proved favourable for the drifting ice, removed by its influence from that which was fixed to the land. In the following year the same ship arrived at Uppernavik about the same time, having had considerable difficulty among very much broken-up ice along the land, and found not two miles of land ice close to the settlement, but the open water rippling on the beach; from the top of the hill nothing could be seen but loose ice among the islands, between which and the pack, in the offing, there was no separation. After hard toil Melville Bay was reached, and it was, if possible, in a worse state for navigation than any other part of the strait from the decayed condition of the ice in it. Every effort was made to make a "north passage," but without avail. Had we been but ten days later in 1845, perhaps we should have been too late for an early north passage. This seems to be well proved by the slow progress which Sir J. Franklin's ships made, through Melville Bay, in company with the "Enterprise" of Peterhead, during the same year, but later in the season. Again, had we been earlier in 1846 there is no doubt a passage would have been made before the end of June; and I firmly believe there is as little doubt it would have been made had the ships persisted until August, at which time it would have been useless to

them as whalers. If an early north passage is desirable it must be attempted early, before the ice is too much broken up, otherwise it will be a failure.

The only thing that could effect a favourable change in the ice would be a strong easterly wind, which would clear out the "scum," that encumbered the sea among the islands: but however desirable this might be, there seemed no chances of its being obtained, and we had to content ourselves with the idea of advancing slowly by dint of perseverance.

There was a light breeze from north or northeast; the clear weather of yesterday still continued, and, from the indications of the barometer, we had every reason to expect it would favour us for a few days. Mr. Petersen came on board, accompanied by his kind friends the Rev. Mr. Mossen and Mr. Flasheur, who soon had to bid him an affectionate farewell, and then make their way back to the settlement in their boat, while we, having set all sail, shaped our course to the northward.

Mr. Petersen brought four fine looking dogs on board, from the settlement at Uppernavik, which were all he had there; but there were three others which he expected we should be able to pick up, at a sub-settlement, in the neighbourhood of a

group of islands known to the Esquimaux by the name Kingatorsoak. In the evening a dense mist came on and the wind died away, notwithstanding which, we arrived at the edge of a decayed floe on the south side of the islands. The Esquimaux observed the ships and came off to us, although the ice was so bad in many parts, that they were in danger of falling through. There was a Dane among them whom Mr. Petersen knew, and to whom he had lent some of his dogs. Thomas—for that is his name—lives among the pure natives, kills seals and other animals as they do, and is married to one of them. He makes the best of his time for himself and his family, receiving oil and skins from the Esquimaux, and giving them in return such things as they may require, of which coffee and sugar are the principal. At the end of June he removes his year's produce to the chief settlement, and hands it over to Mr. Flasheur, who pays him for it in money or in goods. He sometimes deals with the natives for the Governor, especially if they have bear-skins to dispose of. He generally visits Uppernavik once or twice a quarter, but his home, in every sense of the word, is somewhere in the neighbourhood of where we saw him. There he lives, appearing to be as happy as a king among the Esquimaux, shut out

in a manner from the world and the society of his brother settlers, carrying on his wild sport, dressed half Danish, half Esquimaux, among ice and icebergs, on and in the sea, islands, rugged land, and glaciers, without perhaps anything in the world to care for, but his wife and children, whom, there is no doubt, he endeavours to make happy,—as happy as he appears to be himself. He soon found out the dogs that were wanted, and, as Mr. Petersen was anxious to have eight, four for each ship, he sold him one for half-a-crown. He was not deficient in sympathy for Mr. Petersen, who was a little depressed, on leaving his wife and little boy and girl. They parted with expressions of mutual affection and ardent wishes, that their first meeting would be under no less favourable circumstances than their parting. Thomas soon found his way to the land with the Esquimaux, and we cast off from the ice, and endeavoured to proceed north, wading in the fog and snow, groping our way with a boat ahead, towing among "sunk rocks," small islands and icebergs.

June 6th.—A light breeze came away for a few hours in the morning from southwest, which brought us to a stand, by setting the ice close in with the islands. Towards noon it was clear and calm, for the mist and snow disappeared, and the wind died

entirely away. The highest temperature in the shade which we registered, was 50° at three P.M., but that of the sea water was never above 31°. The ships were made fast to a small iceberg which was aground on the north side of a small island. A party went to the top of an island which was close at hand, and had a splendid view of the Strait. Captain Penny discerned seven or eight ships coming up the Strait, off the settlement of Proven: yet the distance between him and them must have been upwards of seventy miles. He could also discern abundance of open water to the northward of Berry or Buchan island; but there were no hopes entertained of getting into it soon, on account of the loose condition of the ice between us and that island. Large flocks of eider-ducks were seen, but they were so shy and wary, that we could never get within shot of them. The recent dung of ptarmigan was seen in great abundance, and two of these birds were shot: the plumage of the male was unchanged, but that of the female had almost entirely changed from white to grey, and in this respect it harmonized with the rocks around. They were discovered first by their peculiarly low wild call, sitting on a prominent rock, and, as they were approached, they first dropped from the eminence, and then could be seen wheeling in noiseless flight to the opposite side of a rugged ravine,

which divided the island into two nearly equal parts. They were followed, and again discovered by their "call," and, after a little stratagem had been used to get within shot, they were both killed, and could be seen trundling down the hill.

This island and others close to it are composed of granite, gneiss, and other rocks of a primitive character. In the ravine, which runs from east to west, huge masses are set free in the overhanging cliffs, and precipitated to the bottom. One might fancy a gang of quarrymen to have been busily at work, with gunpowder and other destructive agents, among the rocks but a few weeks previously. At an elevation of from thirty to forty feet, on a comparatively level part of the west side of the island, we observed a block of granite without a single flaw, measuring sixteen feet in length, fourteen in breadth, and twelve feet in height, and resting on the hard rock beneath, which presented quite a different structure. How it came there, and at what time, were questions, which could be solved by reference to the period in which the island was still beneath the waters of the ocean, which was then occupied, as it is now, by thousands of icebergs, carrying each, perhaps, thousands of tons of rock, and scattering it over the bottom of the sea, for many hundred miles distance from the spot whence it had

been received. The specific gravity of granite being 2·5, this block would weigh at least one hundred and eighty-six tons; it would require a cube of ice, with a side of forty feet, to give it buoyancy in the water, and seven fathoms water to float it along. From this it may be easily conceived what an enormous mass of extraneous material icebergs several miles in length and breadth, and drawing two to three hundred fathoms water, are capable of transporting from one place to another, without appearing to be in the least encumbered by it. Mr. Petersen told me that he once laid his nets for white whales in the month of October along the land, where there were only a few fathoms water, and, having left them quite clear, he returned in a few hours to examine them, and, as may be supposed, was pleased to find that some of the buoyant parts had disappeared under water; a sure sign, he thought, that the animals for which they were intended had been entangled in their meshes, and had died, and sunk to the bottom. He proceeded at once to haul them in, but, to his astonishment, they did not contain a white whale, but an enormous boulder, which he found it impossible to move on the bottom, or to disentangle; and the only way by which he recovered part of his net, was to cut away the portion of it in which the boulder lay. A small berg had been observed in the neighbourhood, which,

in passing, took the opportunity of dropping one of its jewels into the nets.

There are three different modes by which extraneous matter can find its way to icebergs, to be conveyed by them to distant parts. When the glacier is moving downwards through a valley, the overhanging cliffs, if there be such, precipitate large quantities of rock in all stages of disintegration to its surface, which may or may not be imbedded in subsequent accumulation of ice, and violent *débâcles*, from the smaller valleys on both sides, bring down boulders rolled smooth and rough sand and mud. This is the most important mode; and there seems to be no essential difference with respect to it between Greenland and the Alps, according to the account given by Professor J. Forbes. After an iceberg has been drifting down the Strait for a considerable time, it often presents a great many ledges under water, which cannot fail to receive the accumulations of rounded pebbles, mud, sand, and sometimes large boulders, which coast-ice may have conveyed from the adjacent shores; and, after its centre of gravity changes by subsequent melting, whatever its submerged parts may have received while in that state, may occupy a position two hundred feet above the surface of the water. Icebergs, with perpendicular or overhanging sides,

are frequently carried into the face of cliffs also perpendicular, where the depth of water is generally very great, and not unfrequently they come into the closest contact with the disintegrating rocks, which can, under such favourable circumstances, be easily removed in considerable quantities.

While we remained on the island the effect upon our eyes of the powerful rays of the sun, reflected with increased intensity from the white snow, was often relieved, by having to walk over some parts where the black land or rock had been left bare by the melting snows; but when we had to cross a small ledge of ice which extended right round the island, it was so painful, that each could be seen contracting and screwing up his features to admit as little light as possible into his eyes, already deeply congested.

The Esquimaux use goggles made of wood, with only a narrow chink for the admission of light. The Danish settlers use glass preservers of various tints, but generally green is preferred. From what I have seen I think the plan of the Esquimaux is the best; and it accords with the relation there is between the eye and light. If the rays of the sun for which the eye is adapted be transmitted to it through a medium which alters its colour, it must also alter its character, and, instead of proving salutary, the remedial agent must become hurtful. Every function is performed

under the influence of some stimulus; and when that stimulus is withdrawn, the action of the organ to which it is peculiar becomes languid, if it does not cease altogether. Also, when it is applied in excess, the action is increased in due proportion, and congestion is the invariable result. The wholesome light of the sun is the proper stimulus of the eye, and exposure to it, as Nature intended, will be borne with impunity; but if the eye be exposed to light, when rendered intense by reflection from a white surface, and probably also altered in its character by the violet rays being absorbed, congestion will be the result, and, if the cause be not withdrawn, inflammation must follow. It is not then the character of the light that has to be altered, but its quantity. This can be done by goggles, according to the custom of the Esquimaux; but I believe far better by spectacles with side-shades, using fine wire gauze of a black colour instead of glass. The wire ought to be first coated with fine silk or cotton thread, both to prevent corrosion, and also to maintain a black colour.* On

* Since writing the above I have seen R. M'Cormick, Esq., Surgeon R. N., who has suggested, for the use of Arctic voyagers, spectacles in which horse-hair gauze of a black colour is substituted for glass of every description. The effect of the black horse-hair gauze is exactly the same as that of black wire gauze; but it is much better, because corrosion is avoided, that being a great objection to the other.

the south side of the island vegetation was beginning to assume a vigorous appearance, while on the opposite, or north side, everything was still frozen up as if it had been winter. The larvæ of *Lepidoptera* could be seen crawling actively over the lichens and mosses, and gnawing the newly-budded leaves of some of the plants. Coming off to the ships in our boat, a small bird was observed on a rock, over which the little waves of the returning tide were rippling gently, and frequently wetting the feet of the bird while it was picking at something in the cracks in the rock. It was found to be a sandpiper (*Tringa maritima*), which is very common on the shores of Davis Strait.

The island is planted on and among whole clusters of small rocks and small islands surrounded by very deep water. Now one can see the drifting floe ice aground upon some of the rocks, and, perhaps a quarter of a mile on either side, icebergs one hundred and fifty to two hundred feet high, drawing upwards of two hundred fathoms water, are carried backwards and forwards by the wind or tides without touching the bottom. The low islands are clothed with short grass between protruding masses of granite, where the disintegrated rock has been accumulating. In this grass the eider-duck hollows out a depression in which she lays her eggs and covers them carefully

over with grass and down. There are, however, other islands much higher than those, and without grass, which the eider-duck makes her resort during the summer months. The breeding localities for the ducks require to be insulated for the sake of safety from foxes, and sloping so as to enable them to remove their young to the sea as soon as they are hatched.

The danger of navigating a sea so full of rocks as that between us and Berry or Buchan Island may easily be conceived. The lead and line are of no use; for the ship's bow may be against the rock when the line will run out twenty or thirty fathoms at the stern. It is rendered safe to a certain extent by ice grounding on some of the rocks which are at the surface of the water: but nothing is equivalent to a good "look out," which must always be kept when the ship is steering through such intricate passages.

CHAP. V.

FROM BERRY ISLAND TO MELVILLE BAY.

Very little Progress. — Berry Island. — Severe Labour. — Light Ice. — Open Water off Cape Shakleton. — Conformation of Berry Island. — Safety of Ships at Icebergs. — Ducks and their Enemies. — Dredging. — Merlangus and other Fishes. — Lepadogaster. — Voracity of the Gammarinæ. — The persistent Odour of the "Smelling Seal." — Entozoa. — Food of the Seal. — Small Islands. — Running Water. — Eggs abundant. — South-east Gale. — Moored to a rocky Point. — Pure Water and brackish Water on the Land. — Land subsiding. — Esquimaux Graves. — Tussoosak. — Danish Travelling Party. — Captain Austin's Squadron. — General Features of the Coast. — Vegetation. — Action of the Sea upon Icebergs. — Visit to Captain Austin's Squadron. — Opinions of the Whalers. — Pleasant Weather. — A Man dying on Board a Whaler. — Leaving the Whalers. — Great Heat. — Signalizing Captain Austin's Squadron. — Cape Shakleton. — Fine Weather. — Narrow Passage. — The Steamers. — Glacier. — Abundance of Eggs. — Vegetation. — Opinions respecting the Ice. — Baffin Islands. — Small Fishes on the Ice. — Melville Bay.

June 12th. — The evening of the 6th was as calm as possible, and the sky was clear, although at first there was a thin mist. We could see objects very distinctly at a great distance, without the assistance of refraction, which at times is great in the Arctic Regions. The tide shifted the position of

the ice on the north side of the island, and opened out a passage for us, which was readily occupied, although we had no means of advancing except by the boats towing, which is but sorry work at best. At midnight a north-easterly breeze came on, which was of great assistance to us at first, but it soon brought a great quantity of loose and decayed ice against the cluster of islands to the westward of us. This so much retarded our progress, that we were again brought to a dead halt at a small iceberg, which was fast aground.

After hard work for six days among the loose ice, we at length got into a space of water which Berry Island makes, by bringing the ice up on the one side, while it can drift away by the tide on the other. The ships were moored to a small iceberg aground on the edge of an island, about four miles east of Berry Island, in latitude 73° 20′, and longitude 57° 20′. The distance from Kingatorsoak to this island is not more than thirty miles, if it be quite so much; yet it occupied six days of our time, and cost the poor sailors a great deal of sweat. I have often observed "all hands" called four times in twenty-four hours, and not at all unfrequently they have been working twenty hours out of the twenty-four for many days in succession. When so much fatiguing exercise had to be endured, the allowance

of provisions and spirits was increased, sometimes one-third, but more frequently one-fourth. It was exceedingly disheartening work; for many times all that had been gained in a whole day would be lost, in half an hour, by a change of tide or an air of wind. The ice was so light and so much decayed, that it flew like froth upon the water before the wind or with the tide; and there was no getting away from it by taking shelter behind an iceberg or small island, for it poured in upon the water in the eddy all round us, appearing to be seeking shelter as well as ourselves. From Berry Island to the eastward, until you reach the glacier, the distance varies very much according to the disposition of the land. It is generally about twenty miles; but not unfrequently a space between two islands can be observed, where it is upwards of thirty. In whatever direction we looked, east, west, north, or south, nothing could be seen but ice reduced to a state of "pack," in which the ships could do nothing. Had we been in the middle of the Strait, I do not think the ice could have been in a more unfavourable condition for navigation. There were, however, two or three large floes between us and some islands to the eastward, through which we expected to be able to make a passage in that direction, and thence towards Cape Shakleton, where every day, from the top of the

island, we could see most clearly a large open water, which was lost to our vision beneath a "water sky" over the Baffin or Duck Islands. Nothing could be more tantalising than this; and certainly Captain Penny and Captain Stewart had little to console them, on their numerous visits to the island, to observe if there were any favourable changes, or any chance of our being able to advance in the direction we so much desired.

Eider-ducks and long-tailed ducks were very numerous, especially the former; there were also a few dovekies, loons, terns, molleymokes (fulmar petrels), and gulls, the latter including kittiwakes (*Larus rissa*), herring-gulls (*Larus argentatus*), and burgomasters (*Larus glaucus*), of most of which several had been shot.

The greatest length of Berry Island is from east to west. It is almost inaccessible on all sides except the eastern, where there is a reef about a mile long running due east, and so raised in two or three parts as to resemble several islands, between which there are accumulations of sand in consequence of a favourable eddy. Along its north and west sides the water seems to be deep; for huge icebergs and large hummocks approach near before they take the ground. On the south and east sides, the icebergs take the ground at a much greater distance,

perhaps a quarter or half a mile, and afford shelter to ships to leeward of them when there is a southerly wind, and the ice is drifting with great violence from the southward. No pressure of drifting ice can drive an iceberg, of even very small dimensions, into shallower water than it would occupy altogether independently of the pressure of the ice. Hence, ships between it and the land, which has a sloping descent, are in no danger whatever of being driven ashore. The dangers of the whalers would be materially increased, were it not for the safety such a place affords to them during southerly winds.

June 18th. — During our visits to Berry Island, the ducks, which frequent it, were found to have commenced laying, and we were thus afforded fresh eggs every day. Some of the nests had occasionally as many as three eggs in them, — of course they had not been visited for as many days; while other nests had an egg removed from each every successive day for eight or nine days. I do not think removing the eggs, before hatching is commenced, is attended with any bad results to the ducks, except, perhaps, making them a little later in the season. If hatching be commenced, however, it is very unlikely the bird will again begin to lay. The Esquimaux always remove the eggs before the birds begin to sit upon them, until they have collected

enough, after which they allow them to lay and hatch during the remainder of the season, without offering to molest them in any way. They have greater enemies than the considerate Esquimaux, in the bear, the fox, and the burgomaster. The bear swims from island to island, and plunders their nests without mercy; but he does not remain long on one island; and they soon resume their old habits. The fox is often carried along upon drifting ice, and landed on one of the duck-visited islands. He may live well for a short time, but it will necessarily be short; for the birds all leave him sole lord and possessor, and do not return that season. The burgomaster gull is always at hand ready to seize upon the eggs, wherever an unwary and perhaps careless duck has left them uncovered. It is a common idea among the whalers that eider-ducks coat or smear their eggs with some fœtid secretion, which disgusts the burgomaster at them so much, that, although pressed for food, he will not attack them; and that those only are open to his attacks, in which this process has been neglected. I think this anything but plausible; for there are no secretions except the evacuations, and that which accompanies the egg itself in its passage through the oviduct, and if it be said to be by either of these, then the one can never be absent, while the other has never

been observed in the nests. The only protection they have for their eggs from the keen-sighted burgomaster is a covering either of down, which they pluck from their breasts and the lower part of their bodies, or of grass, both of which are sometimes found in the same nest. The down is generally intimately mixed with small fragments of rock or sand, which prevents it being blown away without interfering with its usefulness in preserving warmth and seclusion.

June 21*st.* — Several whalers were observed coming up from Kingatorsoak, which we had but left on the 6th; but their progress, like our own, was very slow, owing to the loose drifting ice, which by this time had become so decayed, that a smart breeze might drift it all away, without any fear of it's being brought to a stand by coming against grounded icebergs or the islands. They were observed following a route leading close in shore, where there was open water among a number of small islands. The water off Cape Shakleton still tantalised us: sometimes it would be within ten or fifteen miles of us, and again it could hardly be distinguished from the top of the island with our best telescopes. The commanders kept a constant out-look upon the ice, both to the northward and to the eastward; and in the latter direction it was gratifying to observe that only

one "nip" intervened between us and the water in shore. On one occasion, when Captain Penny believed that an opening had been made to the north-eastward, the ships were cast loose, all sail was set, and every one looked forward to a speedy release, when, all of a sudden, a thick fog closed in around us, and we were glad to get back to our old moorings at the iceberg.

While we lay in the neighbourhood of Berry Island dredging was frequently attended to, by Mr. Goodsir, to whose extreme kindness on many occasions I am deeply indebted for valuable lessons, which enabled me to attend to a duty which I would have otherwise neglected from want of experience. The display of animal and vegetable life before us, when the dredge was emptied, was really wonderful. Whole heaps of Mollusca, Crustaceans, Annelidans, and Echinodermata could be seen tumbling out from among masses of sea-weed, which again included great varieties, from the Laminaria downwards to the simple brittleworts. In ten to fifteen fathoms Laminaria with a perforated frond and percurrent midrib are very abundant; and they are studded over with minute corals, which impart a white spotted appearance. It occurred to me, at one time, that these animals might have produced the regular and sieve-like perforations all over the leaf;

but, having observed the perforations when the plant was in a very early stage, I had every reason to believe that they are peculiar to it in its natural state. At the same depth, the sea-urchin, and great varieties of worms (*Annelides*), are very abundant. Shallowing the water a few fathoms, Crustacea became very abundant, but none were of very large size. The shrimps (*Crangon* and other allied genera) are the largest, but not the most abundant. *Nudibranchiate Mollusca* are very abundant at this depth, and several specimens of the Doris and Tritoniæ were obtained. It is, however, in from one to six fathoms that the greatest variety of form of both animal and vegetable life is to be found. The frond of the Laminaria, taken from that depth, presents a living surface of minute Entomostraca (*Cyclops*), which can be seen running about and struggling, after the plant is removed from the water, and not unfrequently rupturing the slender peduncle of their external pouches of fecundated ova, which are often left in detached masses behind and around them. The bottom is covered with a thick coating of brown slime, which is composed of confervæ and other minute algæ of great beauty, when examined microscopically, and is the habitat of myriads of creatures belonging to the genera *Caprella, Cyclops, Gammarus*, &c. Several small fish were obtained. The "River Bull Head" and the "Father-lasher"

were represented by *Cottus quadricornis* and *polaris*, and the whiting of the British coasts, by *Merlangus carbonarius* and *M. polaris*, of which specimens were obtained. These two species of the genus *Merlangus* are distributed very extensively over Davis Strait, and the adjoining Polar Seas. They generally swim close to the surface of the ice, and when disturbances take place among it, they are not unfrequently left dry on the floes, ready to become an easy prey to such birds as the ivory gull (*Larus eburneus*), which always frequents localities where the ice is suffering from pressure. I have often seen those birds picking among the newly turned-up ice, as well as at the edge of the ice that may not have shifted its position; and I have often examined the contents of their stomachs, and visited the localities frequented by them, and hardly ever failed to find the above remark fully corroborated.

One or two specimens of Sucking-fish (*Lepadogaster*) were obtained. It is not above ten lines or an inch in length, and the head is out of all proportion to the body for size. The creature seemed to carry its unwieldy head with great difficulty, and to be in constant danger of being attacked, for it always endeavoured to hide itself, or to seek seclusion among the confervæ which came up along with it in the dredge. The eyes are very large and prominent. This seems

to be a provision of Nature to conceal the creature from detection; for, if once it is detected, I do not think it can escape from its enemies. The first individual I caught was at once removed from the dredge into a glass vessel, containing sea-water and a great variety of Crustaceans, and among others the *Gammarus Arcticus*. In a few (perhaps not two) minutes, the new-comer was discovered and seized by one of the *Gammarinæ*: in an instant three or four more rushed into the "melée;" and before I could render any assistance, or interfere with the depredations committed on my little prize, no part of poor *Lepadogaster* remained but his head. The *Gammarus Arcticus* is so abundant in the Strait, and it attacks animal matter with such rapacity, that dead seals cannot be left in the water one night, without sustaining serious damage; and in less than two days, in some localities, an entire seal of large size, with the skin unbroken, except where the wounds by which it died had been inflicted, will be found reduced to a perfect skeleton. I observed a dead seal in the water, which an Esquimaux had been towing for three hours. A great number of these active little creatures were in the water around it, and they could be seen going in the direction of one of the wounds in the skin, by which they entered a large chamber which they had hollowed out beneath

in the flesh and blubber, of which they are very fond. Mr. Petersen shot several seals; but, in consequence of the sinking tendency they have at this season, we only succeeded in getting one, which happened to be in shallow water. It was the rock seal, which is a variety of the common seal (*Phoca vitulina*), and which Mr. Petersen says is the "smelling seal" (*Phoca hispida* of some authors). It is believed by the Danish settlers that the disagreeable odour which the male seal possesses, at certain seasons, resides in his snout. It is very persistent. The skin of the animal will not only retain the smell itself after a great many dressings, but it will also impart it to other skins that may be brought into contact with it in the storehouse. A few minutes contact with the female will so infect her flesh, that it becomes equally disagreeable when used as food as that of the other. It is remarkable, however, that she has the power of repelling it while alive, for it can only be imparted to her flesh after death. The natives do not use the flesh of the male as food when it is in this state, unless they are short of provisions.

I looked into the stomach of the seal while the men were flensing it, and found the remains of Crustacea and fishes; the latter included the two well-known species of *Cottus*, and perhaps, also, two species of *Merlangus*. These genera could be easily dis-

tinguished, because the skeletons seemed to have suffered but little from mastication, for which the teeth of the seal are but ill adapted. There appeared to be bones of other fishes, but digestion had advanced too far with them to enable any one to make out to what fish they belonged. The lining membrane of the stomach was exceedingly vascular, and in several parts it was perforated by depressions or sinuses, out of which bundles of Entozoa (very probably *Echinorhynchi*) could be seen rising like the expanded tentacula of the sea-anemone (*Actinia*). Although I did not examine carefully for the retractile proboscis with its recurved hooks, which would have enabled me to distinguish the characters of these creatures, I think the position they occupied, with one of their extremities inserted deeply in the tissues of the stomach, may lead to the idea that they belong to this genus of the *Acanthocephala.*

June 22*d.*—The ships were cast loose and directed in shore among the loose drifting ice, which was beginning to favour us by partial separation. In the course of the forenoon we succeeded in getting through the ice, and arrived at the islands surrounded by open water, where we met no fewer than a dozen whalers, which were all waiting a passage to the northward. The state of the ice was very unfavourable both for us and them, its decayed

state permitted us to approach much nearer the land than was necessary for making a north passage. The most preferable route would have been thirty miles to the westward, at the edge of ice extending from those islands in one continuous sheet. Instead of this, there was ice which scarcely possessed sufficient firmness to support a fox. The ships were moored, as usual, to a small grounded iceberg, on the south side of one of the islands. On the opposite side of the same island one iceberg, at least two hundred feet high, was within thirty or forty feet of the almost perpendicular cliffs. During clear sunshine in calm weather, so close in with the land, we felt uncommonly warm. The snow upon the land was disappearing very rapidly, and small streams were beginning to establish their seaward channels: icebergs, too, yielded copious rills, and noisy cascades fell from their sloping and overhanging sides. There appeared to be a great change going on around us, and very frequently a slight swell would reach us, announcing the convulsive struggles of some huge iceberg. Those who were fond of sport had no reason to complain, for they could gratify their propensity upon the eider-ducks, from behind a prominent point, where they could lie concealed from the birds as they flew close past them. Many of the whalers had sent away their boats in quest of eggs

among some of the smaller islands. And some of them were returning with thousands of dozens of ducks' and loons' eggs, almost all quite fresh. What a luxury to the seamen! as many eggs, and often far more than, they could use, over and above their usual allowances of provisions. When the whalers are successful in the "egg way," as they call it, it is almost a sure sign that they are to be unsuccessful in the whaling, in consequence of being too late for the Ponds Bay fishing, which is generally very good during the last week in June, and the first three weeks in July.

June 23d.—The wind blew keenly from the southward during the greatest part of the morning, consequently there must have been a good deal of sea off the island of Kingatorsoak. Our ships lay very comfortably moored to an iceberg, that was aground on the southern part of an island, at such a distance from it as to leave ten times enough room for them to swing about. There was no fear of being driven ashore, for the iceberg had been brought from the southward, and any additional impulse would fail to drive it into shallower water. In such a position the Arctic navigator can weather out a gale without the slightest fear of danger, except there be such a sea as make ships seek shelter in secure harbours. Immediately after Morning Ser-

vice, Captain Penny went to the top of the neighbouring island, and, having seen a "lead" to the northward, he returned very hastily, and in a few minutes we were under sail, at first making a tack or two to get round the southernmost point of the island, and then running between it and a small island which is about east of its northern extremity. We only advanced six miles when we found the "lead" shut, and all our efforts to force through it were unavailable. After plying up for three hours, we arrived at the north end of one of the islands, and moored the ships to a small iceberg which appeared to be fast aground close to the land. The iceberg floated in a few minutes, and, as might be expected under all the circumstances, it began to drift to leeward. The ships were again under sail, and, after working a little farther to windward, they were safely moored alongside the "Princess Charlotte" whaler, in the shelter of a rocky point, where there was very deep water. Our warps were fastened to anchors placed securely in the ice, that had been squeezed up on the point in winter or spring during a violent northerly gale.

June 25th.—We weathered a very violent gale, with snow and sleet, from about S.W. Three days previously, the barometer was considerably below its average, and always seemed inclined to fall, which it continued to do, until the gale was at its highest, after

which it began to rise gradually as the weather moderated and the wind became easterly. The temperature of the air ranged from 37° to 32°, and that of the water 32° to 31°, always varying according to the rapidity of the tide and the quantity of ice or icebergs on it. If the tide is very rapid and the ice in a manner fixed and not permitted to move along with it, the temperature of the water will be considerably lower than it would have been, had the ice been at liberty to drift about. When the weather was at all favourable, a boat was kept bringing off water from a small stream on the island. It was found to be quite pure and wholesome; and the opportunity was made available to fill up our casks. It is not necessary in Davis Strait to take in water in this way, for ice can be obtained almost always from the icebergs, which yield water of the purest quality. The whalers, however, prefer taking in water itself, because it saves the fuel which would be expended in melting the ice. They frequently obtain it from the surface of the sea-water ice, which is generally pretty free from salt, although it sometimes gives such indications of saline matter as to be quite unfit for culinary purposes. Sometimes the water on the land is brackish and unwholesome. This is owing to the quantity of saline matter which is set free by the process of

disintegration. I have often found the water in small pools, in depressions in the granite rocks, so salt that it could not be drunk with safety; and on the west side of the Strait I have seen in the possession of the Esquimaux small quantities of Glauber's salts (*sulphate of soda*), which they said was to be found in considerable quantities in the bottom of pools in the rocks, after the water had escaped by evaporation.

Some of the crew were making short excursions over the island in search of ducks' eggs; while others were scrambling on knees and hands in the cliffs and precipices, attacking the affectionate dovekies on their nests, which they often robbed. In some of our rambles very old burying-places and ruins, in all respects resembling those seen among the Esquimaux on the west side of Davis Strait, were discovered. The remains of one or two of the huts were so near the tide-mark, that Mr. Petersen said he was sure the land must have subsided since they had been built, for the natives would not have had their huts so near the sea as to be in constant danger of being overwhelmed. Here, then, the humble hut of the Esquimaux becomes a valuable record of the changes which the crust of the earth may be undergoing; and it deserves to have its place beside the Temple of Serapis and other noble relics

of antiquity.* Captain Graah and Dr. Pingel have adduced proofs that the coast of West Greenland has been subsiding for a space of more than six hundred miles from south to north. Their observations extended from the vicinity of Cape Farewell to Disco Bay, latitude 69°; but this is at least two hundred and seventy miles further north than the extreme limits of their observations.†

The Esquimaux graves are oblong piles of stones, which had been raised to preserve the bodies from the attacks of foxes, wolves, dogs, and other animals, but not to prevent the action of the weather, which, by alternations of heat and cold during the summer months on a southern exposure, facilitates decomposition and renders the bones more friable than they would have been had they been completely buried in the soil, or left entirely exposed to wind and weather on the surface. At a short distance from one of the graves I observed a human thigh bone lying among the rocks. It had been fractured during life. Perfect union had taken place; and, although there was a little deviation from what would please the eye of a critical surgeon, I have no doubt the poor Esquimaux was very glad to have its use restored to him again

* Sir Charles Lyell's Principles of Geology, 1847, p. 489.

† Ibid, p. 506.

as it was. The huts in the neighbourhood appeared to have been in complete ruins for many years; for they were all overgrown with rank grass, which covered pieces of the bones of whales, walruses, and bears. By the most careful examination that I could make, nothing could be detected that differed in the slightest possible manner from the remains of the Esquimaux on the opposite side of Davis Strait, where the dawn of civilization has never appeared, and where there are no signs to indicate that it has been visited by settlers belonging to any other variety of the human race but the aboriginal Esquimaux. A few miles from where we were lying, there is a place known to the Esquimaux and the Danish settlers by the name Tussoosak, and to the whalers by "Old Uppernavik," which is very probably the limits of the discoveries of the Northmen.* It is almost entirely deserted by the natives; although, from the number of ruins, one can see that it was at one time a favourite resort. The Danes know nothing of Greenland to the northward of

* In spite of the perspicuity which seems to have been thrown upon the settlements of the Northmen in Greenland and the extent of their discoveries, by Humboldt, in his "Cosmos," the opinions and observations of Rafn, Brynjulfsen, and Graah are still waiting to be corroborated and confirmed by subsequent observers.

73½° or 74°. A reward was offered a few years ago by the Danish Government to the settlers, if they would make a journey to the northward for the discovery of the iron mountains, which the Esquimaux are said to have reported to Sir J. Ross at Cape York, in latitude 76°, in the year 1818. A party, of which Mr. Petersen was one, started with dogs and sledges, I think in March: but, in consequence of under-estimating the distance to Cape York, they failed in their undertaking, and had to turn after they had got north as far as Sugar Loaf Hill, in latitude 74°. Beyond this they possess very little information; for their ships rarely if ever pass to the northward of latitude 72° 50′, where Uppernavik, their northernmost settlement, is situated.

Captain Penny and Captain Stewart, accompanied by a small party, ascended to the top of an island about three miles to the eastward of where the ships were lying, and had an extensive view of the Strait. The ice had become quite close to the northward and northwestward: to the westward it had slackened a little, and to the southward, in the direction of Kingatorsoak, there was nothing but open water.

The water off Cape Shakleton could not be discerned any longer, for the southerly gale had drifted the whole body of ice to the northward; but still it was very probable there would be open

water on the north side of the Baffin or Duck Islands. There was very little ice among the islands where the whaling ships lay scattered before us, moored to icebergs and sheltering points of the land. Several ships were observed off Kingatorsoak, and, among them, one or two whalers that had come from Greenland, and the squadron of two ships and two steamers under the command of Captain H. T. Austin, C.B., in search of Sir J. Franklin, were observed. They appeared to be coming up the Strait; but it was very unlikely they could get far, for the impenetrable pack extended to the westward on a line about ten miles south of Berry Island. The island we ascended is about nine hundred to one thousand feet in height. An outline of its surface would present a thousand irregularities, besides the slope which it has to the S.W., S., and S.E., and the bold and perpendicular front which it exposes to the drifting ice and towering icebergs in a north-western aspect. It is chiefly composed of metamorphic rocks very much contorted. Strata of gneiss can be seen, twisted and contorted violently by protrusions of granite and quartz in almost all parts of the island, except at its southern extremity, where the granite seems to pass in one entire mass beneath the stratified rocks. It is very probable, however, that this is only an accidental, although, at the same time, an exten-

sive protrusion of the granite, because, only a few miles to the southward, another island rises out of the water, which presents exactly the same features, —bold and almost perpendicular in a north-western aspect, where the contortions are very well seen; rough and rugged throughout its whole extent, and disposed to slope gradually to the water's edge at its south and south-eastern extremity, where the granite can again be seen passing underneath the other rocks.

Some of the plants on the island were in full bloom, especially those with a southern exposure. One or two very early plants—the purple saxifrage, and the *Dryas integrifolia*—were beginning to fade; while not a few poppies and other late plants had their flowers still unexpanded. A small fern (*Woodsia* ——) was picked up in a warm sunny spot, which was both dry and well sheltered from the northerly winds; conditions which, I suppose, are essential in such a high latitude—73° 20′, and at an elevation of at least three hundred feet—to the development of such a plant. On our passage back to the ships, in the boat, we had to pass close to an enormous iceberg, which appeared to have been aground for a very long time. It appeared not to have moved for at least six months, by the remarkably deep groove which had been worn in it right round at the surface of the sea. There were no

means of ascertaining the exact depth of this part that had been hollowed out; but I think twenty feet would be a safe estimate. There were no fissures in it, otherwise this undermining by the water would be continually attended by the precipitation of large masses of it into the sea. It is very probable, that in such a position between two islands the tide runs rapidly, and subjects icebergs coming into it to a constant change of water, which, becoming heated at the surface by the action of the sun in clear weather, will have a tendency to remove a larger proportion, by solution at the line of junction with the surface, than at greater depths.

June 26th.—After a view from the top of the large island, visited yesterday, the commanders of our Expedition came to the conclusion that we should go out to Berry Island, and attempt to effect a passage where the ice appeared disposed to slacken, in the direction of Cape Shakleton. We soon arrived at the island, and moored the ships to a floe that had been brought to a stand on the reef at its eastern extremity and on a large iceberg, half a mile to the eastward of the reef; this was the only large floe that could be seen within many miles all round. We had a fine view of the strait, north and south, from the top of the island, but no open water could be detected as usual off the Duck Islands, nor were there any

lanes among the "pack" which would enable us to force a passage to the northward. As no good could be accomplished by remaining so far from the land, the ships were again cast loose, and in a few hours we found ourselves among the high islands, which we had left but twelve or fourteen hours previously, where the ships were moored to an iceberg, to wait the first chances of any possible opening that would be advantageous to the object of our Expedition.

June 28th.—Mr. Stewart received orders from Captain Penny, to proceed in the "Sophia" to the squadron under the command of Captain Austin. At ten o'clock in the morning, we parted company with the "Lady Franklin;" and, by the assistance of a light northerly breeze, which sprung up in the evening, our little ship came in among the other ships at five or six o'clock. They were moored to icebergs that were aground on sunk rocks, to which I have already alluded, about ten miles to the southward of Berry Island. The "Sophia" looked very small indeed, when compared with those ships of war, whose aggregate tonnage, roughly estimated from their appearance, was not less than eighteen hundred or two thousand tons. The tonnage of the "Sophia" and of the "Lady Franklin" amounted to something below three hundred and twenty.

Mr. Stewart went on board H. M. S. "Re-

solute," and, after meeting Captain Austin and receiving letters, despatches, &c., which had been sent out by him for our Expedition, he returned to the "Sophia" at ten o'clock, bringing from H. M. S. "Pioneer" several boxes of "balloon" material, and other similar articles which had been neglected to be sent to Aberdeen, from H. M. dockyard, before we sailed.

June 29th.—At six o'clock in the morning we came up to where we had left the "Lady Franklin" and about half a dozen whaling ships. They were still waiting an opening in the ice; and the top of one of the highest islands in the neighbourhood was never without two or three commanders on the outlook, for a favourable change. The loose ice had drifted so far north, that, from an elevation of nearly one thousand feet, the water at the Duck Islands could not be seen clearly. An idea prevailed among some of the most experienced of the whalers, that the strong and long continued southerly gales we had for a week previously would cause an influx of water into the Strait, and that this again would cause such high tides, that whole ranges of icebergs, which before pent up the ice, by being fast aground, would be floated off, and would permit the drifting ice to resume its natural tendency to move to the southward, in calm weather, and better still in northerly winds. One of the

whaling masters had come to the conclusion, that it was worse than useless to persevere north at so late a period as the first of July. He had an idea that nothing but loose "pack" would be met with on the "east side," which would hamper the ships, and prevent their getting through "the bay," until the last bit of land ice in Pond's Bay should disappear. The majority of the whalers, however, thought that some good might be done by getting across, even although July were more than half through. It would depend entirely upon the condition of the ice in Pond's Bay; there being generally abundance of whales when there is fixed ice.

On board one of the whalers I saw a man in a dying state. His disease was some affection of the lungs, very probably of long duration. He was a native of Shetland, and had shipped into the whaler along with a number of his countrymen, who, although rough and harsh in many respects, endeavoured to mitigate his pain by every kind of attention. He died in the evening, and was to be buried on the following day. There is hardly an island on which one lands, from the Arctic Circle to the top of Baffin's Bay, but it will be found in a manner consecrated by the remains of some British seaman, over which the Burial Service has been read, and a green mound has been raised, and marked by a monument, of which St. George's

Cross is the most common form. The following are the inscriptions on two graves, which I often saw when landing on Berry Island:—

"Sacred to the memory of Andrew Turnbull, who died on board the 'Dordon' of Hull, April 29th, 1837, aged 11 years.

"R. Nesbett."

"Erected in memory of James Craig, surgeon of the 'Rambler' of Kircaldy, who died June 19th, 1825, aged 19 years."

With the exception of an occasional visit from the whalers, or the Danish settlers, and the Esquimaux, our friends buried within the Arctic Circle lie forgotten by all, except perhaps their relations, and unvisited, save by the eider-duck, which makes her nest among and on their graves. Their remains mingle with those of the uncivilised and untutored Esquimaux. The savage of bygone ages and the Christian of the present generation hold peaceful intercourse in the language of the dead. How true are the words, "the small and great are there; and the servant is free from his master!"

June 30th.—Immediately after Morning Service, as a favourable report had reached us from the hill-top, the ships were cast loose from the icebergs to which they had been moored, and our course was shaped to the northward. The whalers cheered us

as we left them, but none of them were disposed to accompany us at present.

The surface of the water between the islands was as smooth as oil in many parts; but occasionally a light breeze, which passed gently over it, ruffled it a little. There was very little ice in the passage we had to take, and what happened to be near us at any time was opening out, under the influence of the tide, much more rapidly than we could advance in the calm, although "all hands" were towing to the utmost of their strength. The ice was much decayed, and it contained amongst it in great abundance the brown slime to which allusion has been made so frequently since we entered the Strait.

About midnight the wind, which at times assisted us along, died away; the passages leading to the northward closed; and our ships became motionless in the water, which appeared as smooth as a mirror, and reflected a very perfect representation of them and the few fleecy clouds that were scattered thinly over the sky.

July 1*st.*—At eight o'clock in the morning, a passage was discovered leading through among the ice in the direction we were desirous of taking. The crew of the "Sophia" manned three boats, and the crew of the "Lady Franklin" four, which went ahead of their respective ships to tow, as there was not

as much wind as would keep steering way upon them. The day was remarkably hot, especially during the three hours on either side of noon. The maximum temperature in the shade was + 54°, but, freely exposed and receiving the rays vertically or at right angles with the bulb, the thermometer indicated + 108°. The temperature of the water was not above + 33°, and frequently it was + 32°. I often thought it was impossible to protect the shade thermometer from the influence of local or solar radiation.

The poor sailors, who had to pull away at their oars in the scorching sun, were bathed in profuse perspiration, and the quantity of water they drank was very great; however, it did none of them any harm. In the evening a light breeze sprung up, which assisted us on a little; but a narrow passage between a much decayed floe and an island threatened to baffle us for a time. By dint of perseverance, we got clear, and commenced plying to the northward, at first with two, then with one boat a-head, and, as the breeze sharpened up, without any at all. Captain Austin's squadron came steaming up in a straight line from Berry Island; Mr. Penny exchanged signals with H. M. S. "Resolute;" and presently the flags or numbers expressing "rocks close a-head" were shewn. But it was too late, for one of the ships (I think the "Pioneer" steam-ship) struck upon it.

However no damage was sustained, and the shock that had been felt proved the necessity there was for other precautions than the lead and line, which afforded no assistance whatever in keeping clear of rocks. On the contrary, the sounding line is positively hurtful on such ground, if it gives rise to the idea of safety, when two or three hundred fathoms may run out, and in five minutes the ship may come bump upon a rock; and when there may be forty fathoms within a ship's length of a rock, on which the ebb tide does not leave four feet of water. The squadron soon went out of sight a-head, and this afforded the best proofs we could wish, that Great Britain was determined that nothing should be left untried which might assist in the discovery of her lost sons. The power of the Royal Navy and the experience of the whaler are both brought into the field. Surely then, with such a combination of knowledge and power, the results we look forward to are not such as savour of extravagance or impossibility.

July 2nd.—Before one o'clock in the morning we came up with and passed the Arctic Searching Squadron, under the command of Captain Austin, moored to the south side of an island in the neighbourhood of Cape Shakleton. I think there was a ledge of ice, along the edge of the island, to which the moorings were fastened.

The wind died away, as usual, at four or five o'clock in the morning, when we were in a narrow channel between two islands, where the tide was carrying the ships to and fro, without the slightest respect for the helpless strokes of the oars in the boats a-head. It was really as fine a morning as ever dawned upon Cape Shakleton. The sky was without a cloud, except a few thin fleecy and feathery shreds that were scattered loosely over it, and distant objects were remarkably visible, without distortion by refraction. Icebergs could be seen and heard discharging their noisy cascades, and purling rills into the sea, and the ice on the surface of the sea, in many parts, was yielding itself up to its fate, where it had formed, without having been carried about by wind or tide, after the example of the floes immediately on the outside of the Cape. Loons were the only birds that were abundant, and they seemed to vie with one another in cheerfulness as they swam and dived in all directions around us. Flocks of eider ducks were seen in rapid flight to the northeastward, but they very rarely alighted in the water or on the islands, which we approached so closely with the ships.

At five o'clock, the Squadron we had passed five hours previously came steaming up, and in less than half an hour from the time of coming round the

point it was within hail of us. A voice was heard inquiring for Captain Penny, and saying, with Captain Austin's compliments, that, had he seen his way clearly a-head, he should have offered us a tow. This was an act of kindness, which deserved to be appreciated at the time; for the tide was carrying us out between the islands at a rapid rate, where there were grounded icebergs and sunken rocks in abundance. We had, however, to regret the circumstances which stood between us and a tow, which was offered with so much kindness, and would have been very timely indeed. In two hours we lost sight of them, as immense volumes of black smoke issued from the funnels of the steamers, and marked upon the sky the direction they had taken. It was rather a novelty in those icy regions to see clouds of black smoke settling to the horizon. Sugar Loaf Hill (an extinct volcano) would be reminded of the days in which it, too, darkened the air with the products of subterranean fire.

As the morning advanced, a sharp breeze sprung up, which enabled our ships to move along, and before noon Cape Shakleton, generally known to the whalers by the name of Horse Head, was seen dropping astern to the south-west, and a splendid bay (Hingston's Bay), once a great place for whales, was opening out. We could see abundance of open water in the direction

of Sugar Loaf Hill, but unfortunately the wind died away, and "all hands" were again at the mercy of the scorching sun on their oars. Some patches of much decayed ice, which had never drifted out of the bay, were passed through. The ice was dirty, and abounded in the brown slime, which has been alluded to so frequently already. A single drop of the slime examined with the microscope presented myriads of infusoria, whose cilia could be detected in rapid motion. There were others almost perfectly motionless, some of which were elliptical (*Naviculi*); and there were also vegetable forms of exquisite beauty: I could see the round sieve-like diatoma, and the siliceous beautifully beaded *Meloseira*, arranged like shreds of lace work, were scattered loosely over the field of the microscope.

In the evening a smart breeze came away from about north, for which we were very thankful, and none were more so than those who had been towing. We plied up at a very rapid rate, passing flocks of loons in thousands and tens of thousands, and occasionally other sea fowl, but they were much less abundant. The land around Hingston's Bay is very bold, and in some parts it is overhanging. The water in it is very deep, if one can judge from a few icebergs that were in it. There are several extensive "rookeries" for the loons all round it. The whalers

call them loon heads, because they are prominent headlands frequented by these birds. To estimate the number of loons at one of those favourite breeding localities is utterly impossible. If one is close in at the foot of the cliffs, the air is darkened by them flying to and from their eggs which can be seen in rows on the shelves of the rock. The rock is almost entirely primary and metamorphic, with one or two exceptions, of which Sugar Loaf Hill is one. This is a truncated cone, which ascends to a height of upwards of 1000 feet, and always presents the same conical appearance from whatever direction it may happen to be viewed.

The bottom of the bay is at least thirty to forty miles to the eastward of a line drawn along the outside of the islands, which, properly speaking, form the coast line. A very extensive glacier was seen entering it, and it could be traced far beyond the little black protrusions of the land on which it rested, and over which it had to seek its way into the sea. This region of ice appears to extend north and south as far as the eye can reach, and its elevation above the sea is always increasing until it is lost on the far distant and northern horizon, where the foot of man, or beast, wild, civilized or domestic, never trod. Its surface is generally smooth, but occasionally one can detect extensive portions which have

a rough appearance at a distance, and greatly resemble some of the icebergs already alluded to, on our passage up the Strait. There is a small conical island in the south-eastern side of the bay. It was surrounded by open water on all sides, and, as there were great chances of its being frequented by eider ducks, Captain Penny sent a boat to it with the expectation of finding some eggs. Mr. Goodsir and Mr. Petersen described it as being literally covered with the eggs of those birds. To have walked among the nests, each of which contained four or five, and sometimes seven or eight eggs, without trampling upon some was impossible. In the course of two hours the boat was loaded with the fresh ones, which they believed were to be found in the nests which contained less than the usual number. When they returned to the ship an account was taken of the result of their labours, and 5000 eggs were found to have been removed, which number they believed was about the twentieth or thirtieth part of the remainder. That all of them should be sound was not to be expected.

The droppings of so many large birds accumulating for thousands of years would soon raise an island to a considerable height above its original level. This happened on several islands on the coasts of Africa and South America; but I do not believe it has ever

been found extending to any great distance into the temperate zones, especially the zones of constant precipitation of rain, although sea fowl are sufficiently abundant in those parts to produce it in very large quantities. There is little doubt this is owing to its being washed away by rains or melting snow, or it may be owing to vegetation, by which it becomes dissipated into the atmosphere, or converted into a thin coating of brown mould on the rock, in which grasses and other plants take root and flourish luxuriantly, affording shelter to myriads of flies and their enemies, the spiders, even on and beyond the 74th degree of north latitude. At the distance we were from the island with the ships the luxuriant vegetation could be clearly discerned, and in that respect it was in the most striking contrast with the rugged and bleak looking land on both sides of the bay.

About midnight we came up to an island extending from east to west, about four or five miles in length, and a little more than the half of that in breadth, which forms part of the northern boundary of Hingston's Bay. Between this island and the land to the eastward, there was an opening in the ice leading in the direction of Sugar Loaf Hill, which is at a distance of ten to fifteen miles farther north. Into this opening we observed that the Expedition under the command of Captain Austin had gone, and having

found the ice close, after advancing two or three miles it appeared to have been the resolution of the commander to remain until it should open, for the ships were all moored either to the ice or to icebergs.

Mr. Penny thought it most probable that an opening would first happen on the outside of the island, as the ice on its north side appeared to be in very large floes, which would be likely to retain their position between it and Wilcox Point during the northerly wind, until water forming on the south side of the Duck or Baffin Islands should extend so far to the southward, that we might get into it from the water in which we then were. Accordingly, the ships were made fast to a small ledge of ice on the south side of the island.

July 3rd.—There was a smart northerly wind during last night and this morning, which we expected would effect a favourable change in the ice to the westward of the island. In making up his mind to try this route, Mr. Penny had great difficulty in deciding whether he ought not to telegraph to the other Expedition, also to try it; and this difficulty arose from the objection there might be to the route if the wind should happen to shift to the eastward, and drift the ice down upon him, from between the island and Wilcox Point. He appeared to think, that if his Expedition should be caught, the other would be clear; but

if he should succeed, then the other, by watching his motions even at a considerable distance, would take the hint to follow. At eight o'clock in the morning the ships were cast loose, and all sail was set, and in an hour and a half a lane of water was entered, which appeared evidently to lead us in the direction of an extensive space of open water, which could be seen very plainly on the south side of the Duck or Baffin Islands and on the south side of a barrier of ice. As we plied up this lane of water it was hourly becoming narrower, but at the same time it was advancing rapidly towards the other water, and before one o'clock in the evening there was but a single "nip" between them. We would have been able to heave the ships through, had it not been for the strong wind; but luckily it began to open; the "Lady Franklin," always leading, thrust into it and got clear, after a little heaving with warps and ice-anchors; the "Sophia" immediately followed, and also got clear, and then both ships commenced plying to the northward.

A number of small fishes (*Merlangus polaris*) were raised out of the water on the surface of a piece of ice, which had come against the bow of the ship when she was passing through the nip. They struggled on the cold ice as the water was leaving them; and there was no doubt they should prove a

hearty meal for some keen-sighted snow bird (ivory gull), that would soon discover them on the ice.

Almost immediately after getting into the open water, the weather became very thick, so that it was not by any means an easy matter to keep company as we plied in the direction of the islands. The wind was very favourable, and raised a "short sea" in the water, which assisted us very much in keeping clear of the ice in the thick fog. At seven o'clock we saw one of the islands, a circumstance which was very gratifying indeed, and at eleven o'clock we saw another, the northernmost we believed, which was still more gratifying, for we expected that a few hours would bring us into Melville Bay.

CHAP. VI.

PROGRESS IN MELVILLE BAY.

Land-Ice. — Prospects of a speedy Passage. — Brought to a Stand. — Cutting a Dock. — Improved Saws. — Little Auks. — Intense Refraction. — Brown Slime in the Water. — Entomostraca of large Size. — Ice opening out. — Joined by the Whalers. — Intercourse with naval Officers. — Ships drawn into Docks. — Young Ice. — Saline Ingredients of Sea-Water Ice. — Land-Ice broken up. — Bear Hunt. — Dangerous Navigation. — Tracking. — Collisions between Ships. — South Wind. — Docking the Ships. — Closely beset. — Steamers in Melville Bay. — Whalers retreating. — Large open Water. — Barometer very low. — Safety of Ships in Docks. — Violent Gale. — Great Pressure upon one of the Steamers. — Gale subsiding. — Dredging in two hundred Fathoms. — Sea Urchins. — Lost the Land-Ice. — Among the drifting Floes. — Open Water. — Dense Fog. — Detained among the Floes. — Action of the Sun upon the Ice. — Breaking up of an Iceberg. — Pointed Eminences on Icebergs. — Refrigerating Influence of Icebergs. — Rejoining Captain Austin's Squadron. — Thick Weather.

July 4th. — After passing the Duck or Baffin Islands, we came to what we supposed to be the land-ice, to the north-westward of Wilcox Point, and continued to work up along it, until our southerly wind failed, and this was at an early hour in the morning. The fog cleared away, and enabled us to see several miles all round. There was abundance of open water, and

Cape Shakleton.
Sugar-Loaf Hill.
Wilcox Point.
The Devil's Thumb, bearing S. E. per compass.

the land-ice was but a short distance from us to the eastward. Towards noon, a light breeze sprung up from S. E., which wafted us along with studding sails on both sides. The land from Cape Shakleton, northward, round by Hingston's Bay, Sugar-loaf Hill, and Wilcox Point, diversified and rugged enough, disturbed by refraction, or intercepted from our view by huge icebergs, was dropping astern very fast; and as the grand land-mark of Melville Bay, "The Devil's Thumb," bearing S. E. per compass, began to open out, we indulged in the fond hopes that the prospect of a speedy passage across that formidable place would be realised; since it had been fairly denied us to get through it early in the season. Melville Bay is not more than one hundred miles in extent, from the position we now occupied, to Cape York, a distance which an ordinary whaler would run in twenty-four hours, with even a tolerable wind. This has been done sometimes; but such good fortune is not the lot of one ship out of two hundred. As a general rule, the earlier in the season it is attempted, the greater the chances are of passing expeditiously through it. The land-ice is then fixed, and the pack moves off in one entire body from it, under the influence of the tide, if the wind is not from the southward; a circumstance which is not by any means common, during the spring months, com-

pared with July, August, and September. And if the wind is northerly, an extensive open space occurs between the two ices, through which a ship may run, during a south-easterly breeze, without being delayed a moment by the usual obstacle, the drifting ice. The "St. Andrew," of Aberdeen, under the command of Captain Dring, got clear of Melville Bay in the beginning of June, having ran through it without seeing a bit of ice for many miles; and on the 13th of that month, she arrived on the west side. But whalers that attempted it at a later period had very great difficulties; and some of them never got through it at all, for they were crushed to atoms among the ice.

Before six o'clock in the evening, we came to a dead stand at the junction of the pack with the land-ice, in latitude 74° 30′. The southerly wind, with which we had been running down so favourably, also favoured the closing of our passage. The ships were moored to the land-ice, which was about five feet thick; and the saws were got out for the purpose of cutting docks, in case it should be necessary to haul the ships into them, from pressure among the ice, which might be the result of a southerly wind, of which the appearance of the sky seemed to afford very threatening indications. The saws had been supplied to our Expedition from H. M. dockyard at

Woolwich, and they were said to be on an improved plan. Perhaps they were; but however plausible the idea of the "pitman" (a heavy ball at the lower end) might be to the inventor, and also the other part of the improvement, we found that they would not work at all, until the form of the teeth was altered, and the "pitman" was removed altogether; after which they were found to answer very well, having been reduced, to answer the description of saws used by the whalers in Davis Strait for at least thirty years. It will be obvious to any one that an unsteady "pitman" at a saw is worse than none at all, and more especially in sawing ice, when it is stated that, without such an appendage, the saw-draft is not above half an inch in breadth, while with it it is about four inches. In the one case, only half an inch of the ice requires to be removed, in the other eight times as much. The cause of this objection to its use is the lateral motion which it imparts to the saw, in spite of the best efforts that can be used to keep it in a perpendicular position. While we lay here, large flocks of the little auk (*Alca Alle*) flew past to the northward, without even attempting to alight in the cracks and openings, along the edge of the fixed ice. Those birds, like the loons, fly from one open water to another, over cracks and openings, in which they can alight from time to

time, to feed and rest. From the circumstance that they never alighted in the neighbourhood of the ships, we inferred, that there was open water at a short distance to the northward, in the direction they were flying, although we could not see it, or any indications of it, with our best telescopes, from the crow's nest. There was little in those inferences to console us, since it was not in our power to put them to the test, by advancing in the same direction.

July 5th.—Our anticipations of a southerly wind were ill founded, for the weather cleared up, and we had one of the most pleasant days that could be wished for. The refractive power of the atmosphere along the horizon was very great; every object around us was distorted in a remarkable manner; icebergs assumed a hundred fantastic forms in the course of an hour, and the ice appeared to be raised in some parts to the height of an insurmountable wall. This was seen to the northward, and it was considered to be an indication of open water, which corroborated the inferences that were made, from seeing the rotges (*alca alle*) flying in its direction.

Twelve ships were discerned coming up the Strait, and only one or two barriers of ice intervened between them and the space of water we occupied. These would open by change of tide and allow the ships to advance towards us. But we expected the

barriers would clear away a-head, as well as open astern of us, and enable us to advance as fast as the others could follow. This was by no means unreasonable on our part, for the ice to the northward seemed to have opened out, and shut at least twenty or thirty times since the middle of May, during any of which openings, whole fleets of ships might have passed through. The sea around us abounded in a brownish slime, which, when taken out of the water, possessed a consistence resembling thin mucilage, and did not mix very rapidly with it, even by slight agitation. By the assistance of the microscope, it was found to be composed chiefly of filamentous algæ (*Meloseira*) and animalcules, which differed from any that I had hitherto observed. Their motions were very slow compared with the active motions of the ciliated infusoria, and their structure seemed to be a gelatinous mass without cilia, which became inflected as they crawled slowly among the fronds of the algæ. I could not distinguish organs of locomotion. At one time it appeared as if the creatures adhered by one extremity, while the other was drawn up by a contractile process. Had I been able to discover the same thing in several subsequent observations, it would have proved the creatures to be some sort of polyp. The slime also contained polygastric infusoria, which were seen moving in the water, with

their cilia in rapid and regular motion. In no part of the Strait did we observe such large entomostraca as in Melville Bay. Some of the individuals which came into my hands measured fully half an inch from the tip of the beak to the extremity of the terminal setæ or spines, and not less than an inch from tip to tip of the antennæ. Their darting motions, and the graceful forms and attitudes which they assumed after each sudden exertion, afforded agreeable pastime to those who could see such beautiful creatures and bestow a few minutes' attention upon them.

July 6th. — Towards morning the sky became spread over with white clouds resembling streaks, wisps and fibres, and it assumed a blue colour over the southern horizon. The barometer was falling gradually, but not to the extent that would indicate a south-westerly gale. Every distant object was remarkably visible, and at noon it was painful to be exposed to the dazzling brightness of the sun. Small flocks of loons and very large flocks of the little auk were continually flying north, and occasionally alighting in the water around the ships. The ice slackened away a-head for half a mile or a mile, and as Captain Penny and every person on board thought it was commencing to open in good earnest after being so long close, the ships were cast loose, and all hands were

called to track them along the edge of the fixed ice. After advancing about a mile, the ice ceased to open away, and in a short time it began to return, which forced us to retrace our steps as speedily as possible to our old quarters, where attempts at cutting a dock had been made. The wind came away from south-west, and in a few hours we were joined by a whole fleet of whalers, and ultimately by Captain Austin's squadron.

The presence of so many ships in regular order at the edge of the ice was really a splendid sight, embellished as it was by the glory of England, the British flag waving in the breeze.

We made the acquaintance of not a few of the officers in the other ships, and, in all our intercourse with them, the principal theme of conversation was the most probable route pursued by the missing ships, and what our chances were of finding them or traces of them. Each had his opinion, for which he could advance reasons that were plausible to himself, and which he endeavoured to make plausible to others. Some appeared to have been reading much about the Arctic Regions, especially that part of it which related to the Franklin Expeditions: others there were who appeared to interest themselves in nothing but the movements of the ice around us, and the chances we had of soon getting clear; and

there were others whose whole attention was occupied in carrying out the orders of their respective commanders.

Mr. Penny went on board H. M. S. "Resolute," and, having seen Captain Austin, he returned on board the "Lady Franklin." In the course of the afternoon, Captain Austin and Captain Ommaney paid us a visit; and, having taken a passing look of our ships and their equipment, they expressed the satisfaction they had in the efficiency of everything connected with our Expedition. I believe they had an objection to the limited room we had in our cabins and sleeping apartments. Perhaps it might have arisen from the contrast in that respect which existed between the two Expeditions. We did not look for commodious state rooms and cabins in such small ships, nor were they at all necessary in such high northern latitudes, where it is an object to be close together, for the sake of saving fuel.

July 7th.—The wind was rather variable during the early part of the day; but towards noon it set in with some energy from about south or south-west, although the sky was very clear, and the barometer was high; there were therefore no serious anticipations of a gale from that quarter. The ice, impelled by the southerly wind, came in around the ships, and aroused the Arctic navigators into activity

Hundreds of men could be seen planted along the edge of the fixed ice, with their saws and triangles busily employed cutting docks for the safety of their ships, in case the pressure should become violent. Their work was very laborious indeed; but it was enlivened by hearty songs, in which one often recognized

"Britannia, Britannia, Britannia rules the waves,"

issuing from one hundred voices, in good time and with better effect. The whalers got into their docks in about four hours; but some of the ships in the fleet were caught in the ice, and did not succeed in getting in at all. Our dock was ready in less than four hours, although it required seven hundred and forty one feet of ice, four and a half feet thick, to be sawed before it was accomplished. Considerable inconvenience arose from the constant liability there was of the saw-draft becoming obliterated by freezing, and it could only be prevented by removing the pieces as soon as the sawing was completed. The temperature of the water was 32°, and at this it could be seen freezing over in the calm pools and lanes, when the sun was low and the weather was clear. Clear weather seemed essential to the formation of young ice on the water, when the temperature of the air in the shade was about +35°, and that of the water itself 32°. It appears strange that salt-water should

freeze under these circumstances; but it is nevertheless true, for it has been observed on many occasions. The only way of accounting for it is, by attributing a refrigerating effect to evaporation from the surface of the water sufficiently powerful to form a film of ice. If this film be examined, it will be found to contain very little saline matter in proportion to the water on which it is produced. The quiescent state of the water affording the saline particles time to subside after their density has been increased by refrigeration, and the property of expansion which water possesses after being cooled down to 40°, until it becomes solid by congelation, are, in my estimation, the real causes of salt-water ice containing less of the saline ingredients than the water. According to this law, cold, although the opposite condition of heat, the chief agent in Nature in effecting wonderful changes, becomes a powerful instrument in destroying the equilibrium of the saline-ness of the sea, and currents and counter-currents will be necessary to restore it, after the comparatively fresh ice has drifted from where it formed and then becomes dissolved.

We observed in the land ice to the north-eastward several large cracks of various widths, from half a dozen feet to as many yards or fathoms. This was

anything but a favourable discovery, for the first northerly wind, which was essential before we could possibly get clear, might send us adrift among all the large floes, and it might cost us weeks of hard toil in the pack to extricate ourselves from its merciless influence. And it afforded another proof that the season was too far advanced for an early, or an easy, or a safe passage through the bay. Here I will repeat, that in the first week in June 1845, when a whaler to which I was attached entered Melville Bay, ice attached to the land presented one continuous sheet, without a single crack in it from end to end. What a facility for an early and a quick passage!

A bear was seen on the floe, and his motions were watched, as he drew towards the ships. About a dozen officers from the Expedition set out in full chase, and succeeded in wounding him, but only slightly; on which he took to the water, and would have speedily escaped, had not one of the boats of the whalers, which had been observing the motions of the party, intercepted him, and despatched him in the water. The prize belonged to the whaling master whose boat had taken it.

Bears can be attacked with most advantage in the water. They endeavour to escape by swimming to the ice, and if it is in the form of loose and detached small floes, they dive underneath some of them, and

appear at the opposite side; or, to elude their pursuers in the boats, they change their apparent direction after diving, and appear in a different place; and before the boat can be got round, they have their breath, dive again, and are off.

July 9th.—The wind veered round to the northward, and cleared away the mist and fog that pervaded the atmosphere during the whole of yesterday. The sky cleared up, and distinct clouds began to appear; and were it not that the indications of the barometer looked a little suspicious, being considerably below its average, we thought that the weather, and other circumstances connected with it, were to favour us. The ice began to open out along the fixed ice between us and the land; consequently, the whole fleet was in motion at a very early hour. The route we had to follow among icebergs was, to say the least of it, very dangerous. In many parts, for many miles in extent, the half of the surface of the water, or the fixed ice, as the case might be, was occupied by enormous icebergs, which extended to a depth of three hundred fathoms. How chilly the water must be, when it is occupied throughout its whole depth by such refrigerators. In groups of eighty or one hundred, planted closely together, and joined in communication by one or two out of the groups, the whole surface seemed to the eye of fancy as if it were

covered over and occupied by towns, linked together by delightful villas, beautiful suburban cottages, and noble and ancient looking castles, and venerable churches in ruins. We made the best of the land-floe that we could, by means of the track-rope; but it was very annoying to be interrupted by icebergs, which often stood out in bold relief in its edge; in which case, the men had to get into the boats, and having towed past it, they had to land upon the ice again, and resume the tracking as before. Eight men on a good floe tracked the "Sophia" along as fast as they could walk: I believe faster than one person could walk, because so many being together seems to afford a kind of support, which is wanting when one may be walking alone. They never went faster than three miles an hour; and if there happened to be wind right in our face, suppose it were but a three knot breeze, twice the number of men could not move along at above half that rapidity. Three boats, with six well manned oars in each, towing the "Sophia" in a calm, could not make above a mile and a half an hour; and even with this, the boat's crews were perspiring very profusely. Among so many icebergs, the tracking was frequently interrupted, before we came to the extreme limits of the water, where we came to a halt, until the ice should open. The other ships soon came up with us, and made fast, some

here, some there, as they could find room and safety, among the towering icebergs and drifting floes.

Towards evening, the northerly breeze died away, and the sky became overcast throughout its whole extent. On the southern horizon, there was a blue appearance, which made the experienced whaler shrug his shoulders, in the anticipation of a south wind. The barometer, too, had been falling, by this adding its testimony to the indications of the southern sky. The ice opened out under the influence of the tide, and permitted us to move along. On one occasion the "Lady Franklin" stuck in the lead, as she was pressing through it, about one hundred yards a-head of the "Sophia;" and as no intimation had been given of the fact to the "Sophia," a collision took place, in which the "Lady Franklin" lost a foot or two of her taffrail.

A more serious collision happened between H. M. ships "Intrepid" and "Assistance," in which there was the loss of a part of the steamer's bridges and bulwarks, and of the ship's jib-boom.

After advancing half a dozen miles the whole fleet was brought to a stand, and as the ice was pouring in around the ships before a strong south wind, their crews were as busy as possible, preparing docks for their safety. In a few hours our two ships were out of reach of the drifting ice, which by that time had

surrounded all the ships and closed up all the water, except small pools between the angular floes. There was a very large iceberg about two hundred yards to windward of our ships, which we feared would move down upon us, and threaten our safety even in our docks. I dare say our fears were uncalled for, because the iceberg seemed to have a firm hold of the fast ice.

July 10th. — The weather continued very disagreeable during the greater part of the day, the sky was always overcast with a dense misty haze, which often resembled a constant falling of fine snow, and, from the force of the wind, and the length of time it had prevailed from the same unfortunate quarter, we had little hopes any open water could remain to the northwards along the fixed ice. Our companions the rotges (little Auks) deserted us entirely, and, with the exception of a few ivory gulls, which were seen perching on the newly squeezed up hammocks, there was nothing within sight to engage the attention of those whose great delight was in sport.

Towards noon and evening, the azure sky opened out, and the clouds could be discerned on it, but the horizon was completely enveloped in a thick fog, which hardly extended to an elevation of two hundred feet. A hard frost set in, which soon sealed up all the water in the pools, and made the snow on the ice

quite hard and crisp. If two or three persons were walking on it their steps might be heard at a considerable distance, long before they could be seen coming out of the fog.

July 11*th.*—Soon after our usual breakfast hour (8 A.M.), all the ships were moving, and extricating themselves from the ice, which was beginning to slacken off as the wind came away from the land. The steamers, sending up dense volumes of smoke, which rolled away to the southward before the wind, added a feature to Arctic navigation which neither we, Melville Bay, nor the Devil's Thumb, had ever before witnessed.

Captain Austin very kindly offered Mr. Penny to take his two little vessels in tow, but unfortunately, just as we were all clear for starting, the fog, which had partially disappeared early in the morning, spread over the whole horizon, and obscured vision so completely around us, that objects such as icebergs could not be distinguished at a distance of two hundred yards. However, we endeavoured to move on by means of boats going in advance, and hailing, every five or ten minutes, "all clear," until we came to a complete barrier, having advanced about four miles.

This was but a short trial that we had of the value of steam among the ice; notwithstanding, it proved, to the entire satisfaction of all in our little Expedition,

that it saved the sweat of those who could take advantage of it in calm weather; and, moreover, they could steam away through bay ice in calm weather, when our utmost efforts to advance a foot were quite useless.

Some of the whalers had by this time turned their backs upon Melville Bay and gone southward; others still persisted in accompanying us, expecting to get clear of the ice very soon, when they would proceed to the westward. Six or seven were moored to the same floe, waiting an opening in the ice which was hourly expected from the favourable wind that was blowing keenly down the Strait, and a little off the land.

About one o'clock in the evening the fog cleared away, the azure sky appeared, and distant objects became plainly discernible at the most remote part of the horizon. An extensive open water was discovered to the northward; but there was a barrier of ice close a-head of the ships, which no influence, except that of the wind or tide, could remove: I must say, with such a good wind, it was rather tantalizing to have to gaze upon an extensive sheet of water, the small waves of which were seen breaking white for miles to the north-westward, along the edge of the fixed ice. At eight o'clock in the evening, the water was advancing rapidly towards us, and in another

hour the steamers got up their smoke, and in a quarter of an hour more we were in the open water, under a press of sail plying northward. It was more than Captain Penny could have expected, to be towed by the already too much encumbered steamers against such a strong wind; therefore, after having been towed from the edge of the ice, he requested the tow-lines to be cast off. Perhaps Captain Austin would be a little puzzled to understand, what Mr. Penny's reasons were for preferring to work to windward, to being towed along in a straight line, and with twice the rapidity. For a few hours, as long as the wind lasted, the steamers with the large ships in tow, seemed to gain very little upon our ships; but about midnight the wind fell, and they were lost sight of far a-head, steaming at full speed, and leaving their smoky wake upon the clear and azure sky.

July 12th.— At three o'clock in the morning the wind, which had been blowing with great keenness from north 22° east during the preceding fifteen hours, and had done so much good by clearing away the loose ice, died entirely away. The barometer in that time had fallen upwards of half an inch, and now it was down at 28·95. The sky, before clear, began to be overcast; and the appearances on the southern horizon were horribly threatening and ominous. We were in the worst part of the bay; but there was no

help for it. If we should be caught among the ice, and our ships crushed to atoms in its powerful grasp, it was a consolation to us that the other Expedition had got on so far before; for their chances of escape we expected would thereby be considerably increased. It will be very clear from this, that Mr. Penny's reasons for not wishing to be towed by the steamers, to their hinderance, under circumstances of which no doubt his experience forewarned him, were not without a solid foundation. Nothing can be worse than keeping the ships close together in Melville Bay, especially when an object is to be attained, in which all are conjointly concerned. If violent pressure should happen among the ice, by the ships being spread over a considerable space, their chances of escape from danger are much greater than if they are within two or three hundred feet of one another. The fearful losses of 1830 are, in great measure, attributable to this cause. If a dock be any safety from pressure among the ice, that safety is reduced by having more than one ship in the same dock. The fixed ice in which the docks are cut is weakened very much by large portions being removed to admit the ships in groups of two or three within spaces of three or four hundred feet. It is also weakened by making single docks close to each other. The ships ought invariably to keep close together when they are moving along,

for fear of parting company; but when they are to be drawn into places of safety, there ought to be at least a quarter of a mile between each, if some particular spot should not offer such advantages as would attract them to rush pell mell into it.

The wind began to blow from south-west, and gradually increased in violence till evening, when it raged vehemently, and brought the ice in the middle of the Strait into the closest contact with that which was fixed along the land. As soon as the breeze began, our studding sails were spread out before it, and our little ships hurried on until the point of meeting of the loose and fixed ice brought them to a stand. They were moored to the latter, and in two or three hours before the ice had completely closed in around them, they were drawn into docks, which, from their depth and the direction in which the pressure was likely to assail them, appeared capable of enduring an ordinary amount of pressure with impunity.

In the evening, about three o'clock, the gale had attained its point of intensity. The large, blue, and angry clouds drifted from south to north with great rapidity, and often mercilessly discharged part of their contents, sleet and rain, upon the merry groups of sailors who were busily employed sawing out their docks. The ice set very closely together, and some

of the ships, which had not got into docks, were beginning to feel it pressing hard against their sides. They were protected by a group of icebergs which lay between them and the drifting ice, and permitted only the smaller floes to pass between them. There was considerable danger, however, of the bergs themselves being driven down upon us; and, in the event of such an occurrence, our anticipations were not very agreeable.

The squadron under the command of Captain Austin could be seen about twelve miles to the northward, among the ice; for there was hardly a foot of open water in any direction. Some of the ships—Captain Penny says, one of the steamers—appeared to have great pressure upon her from the angle of the masts, which were the only parts that could be clearly discerned above the horizon at such a distance. From the direction in which they lay, and the direction of the line of the fixed ice, we entertained great fears that they had lost the valuable guidance of the fixed ice which every whaler follows, by even the longest detours, knowing that, if he loses hold of it, his chances of advancing are very much diminished, especially if he is in Melville Bay. The ice, too, in which we had taken shelter, in company with seven whalers, was discovered to be detached from the land; but, as it was in floes of very large size, some of them

at least ten or twelve miles in circumference, we had reasons for expecting an opening to appear between the floe and the much broken-up ice outside with the first favourable northerly wind.

The barometer commenced to rise with the commencement of the gale, and continued to do so steadily after it had reached its acme, and had begun to subside. The temperature of the air at noon was +40°; and three hours later, with and during the violence of the gale, it fell to +34°. The high temperature during the early part of the southerly wind, and when there was but a gentle breeze, was, without any doubt, owing to a large space of open water, which the previous northerly wind must have freed from drifting ice; and the diminution of temperature, during the violence of the gale, and when the sky was loaded with clouds, was caused by the immense extent of icy surface, in the form of pack, over which the wind had to pass with great velocity. The temperature of the water was 32° at first; but, as the ice came close together around the ships, it fell to 31°, at which it remained until the ice opened out, and the sun began to shine brightly upon it.

July 16th. — After remaining quite close for several days, the ice began to open out a little,

under the influence of the tides and light northerly and easterly winds. The icebergs began moving about, and by this means they kept up a constant source of alarm among the wary whalers, who from time to time deepened their docks, to secure the safety of their ships, in the event of a collision between them and the icebergs.

A dredge was lowered to the bottom, at a depth of upwards of two hundred fathoms, and it was dragged along for a short distance, as the opening in the ice permitted. When it was taken up, it contained nothing but a little mud, and fragments of a sea-urchin, which had been smashed at the bottom. From an examination of the different parts of this creature, there appeared to be no deviation from the ordinary form and structure of the sea hedge-hog of the British coasts.

Although we could not observe any difference between creatures from such great depths, and other creatures of the same genus from shallow water, it does not necessarily follow that there is none. It is impossible that the creature, adapted to live where the superincumbent water is only five fathoms, can also live in localities where it is upwards of two or three hundred fathoms, without some provision, which, unper circumstances so different, ought to be clearly discernible to ordinary observation. This was at a

distance of nearly thirty miles to the westward of Cape Seddon, in latitude 75° 14′.

A smart breeze sprung up from N. E., which opened out the ice around us, and made large lanes of water among the large floes between us and the land. This was very discouraging indeed; for, had we been able to stick by the fixed ice, we should have advanced very favourably with such a wind. As we were now situated, it was probable the ice might not open out sufficiently, until we had been carried among it far to the southward. We could always see the ships of Captain Austin's squadron closely beset among the ice where they had been first caught.

July 17th. — At an early hour in the morning, Captain Penny and Mr. Stewart were on the look-out for a lead, as the ice had been moving a little during the night. Immediately before breakfast, the ships were cast loose, all hands were called, and a bold attempt to push through every difficulty was at once commenced. The whalers became disheartened one by one, and had made up their minds to retrace their way to the southward, as speedily as the state of the ice would allow. The most sanguine among them could expect to accomplish nothing in the way of killing whales, by getting into Pond's Bay at such a late period of the season. As we were about to

part with them, we felt that the extreme kindness we had experienced at their hands entitled them to our warmest gratitude; and we could not but express feelings of sympathy with them in their want of success, both in whaling early in the season, and in their attempts to make a north passage.

The dexterity displayed by the whalers in working their dull ships among the ice, and the sudden evolutions which they perform with them in the most intricate passages, together with the alertness of their crews on every occasion, afforded subject for admiration to the officers of the Royal Navy who had been in company with them, and more especially to Captain Austin, who paid them a very high compliment, by saying, that, had he a son intended for the Royal Navy, he would send him to serve a short apprenticeship in a whaler, where he might learn to manage and work his ship with life and activity.

The wind continued from about N. E. during the greatest part of the day; the sky was clear, and there were pleasing indications of favourable weather for one or two days at least, although the barometer was not up to its average height.

The ice slackened along the chain of floes which stretched to the northward between us and the land, and afforded the only passage that could be taken. From seven o'clock in the morning till nine at night

all hands had a busy time of it, "tracking," "towing," "warping," "heaving," and sailing, up one lane of water, down another, and across a third, round this point, and through that "nip," until we got into open water, of which the northern limits could not be seen. The wind veered round to the southward, and invited our studding sails to be spread out, and, in a few minutes, we were scudding along at the rate of two or three miles an hour. The ships of the expedition under the command of Captain Austin were seen, at this time, quite plainly from the decks of our ships. They did not appear to be clear of the ice, but the black smoke was rolling in immense volumes before the wind, and this we took for a pleasing sign that they would soon be as free as ourselves. We had no doubt they had lost hold of the fixed ice, a circumstance which, by this time, they would have reason to lament rather seriously. At half-past nine o'clock, a dense fog came on, after the last puffs of the southerly wind had died away. Our good fortune was not intended to last long; however, as there was abundance of open water we groped our passage among the large floes, with eight or ten men, tracking each ship at the rate of about two and a-half miles an hour. The remainder of the crews were ordered to their beds, with the expectation we could carry on for an

indefinite time, by making one-half the crews relieve the other.

At eleven o'clock we came in between two very large floes, which appeared to be coming together with great rapidity. The "Lady Franklin," was headmost, and had just passed through: it was a critical moment for the "Sophia;" for, most probably, the rapidly advancing floes would have met in her hold, had the men not exerted themselves with an unusual amount of energy on the track-rope. As she cleared the extreme point of one floe, and before she was quite her own short length beyond the point of danger, the collision took place, and a rising ridge of hummocks marked the spot we had occupied but two minutes previously.

At midnight, we came to a decided halt, owing partly to the dense fog, which prevented us choosing the proper "leads," but principally to the closeness of the floes among which we had to seek a passage. Captain Penny remarked, on several occasions, that there must have been open water for a considerable time where we then were. He appeared to lay great stress upon the appearance of the ice at the edge of the floes and "sconces." It was quite level with the water, as if it had bent down from a plane with the surface after the upper part of the portion under water had been dissolved. It is very probable, there

had been open water around those floes for some time, since they had become detached from the main body of the land ice: and it is certain that there had been no pressure among them; for, in that case, the edges would have been turned up. But, at the same time, it is equally probable that three or four days of a hot sun, in which the exposed thermometer rose to 104° at noon, would effect a great change upon the ice by the direct rays, and also by heating the water in which it floated. A few hours' action of the sun's uninterrupted rays upon the water, if ice is not close at hand, produces a change which the thermometer never fails to indicate. The register of the temperature of the water for yesterday and this day shows an increase of two or three degrees during the hottest time of the day. The water is always colder when the ice is not at liberty to move along with it, than when it is free to move under the influence of both wind and tide. If the water be carried past the ice, as happens in the case of fixed surface ice and icebergs, or if the ice be carried past the water, as happens in the case of ice drifting rapidly before the wind, the invariable result is solution of the ice and cooling of the water, provided that the temperature of the water be above that at which the ice had formed.

July 18th. — At two o'clock in the morning a light breeze sprung up from about south, which partially

cleared away the fog, although still a whitish mist pervaded the atmosphere in every direction. We saw our passage very clearly into open water, leading along a compact body of ice between us and the land. Studding-sails were set on both sides, and as the ships glided onwards, passing the motionless floes on the unruffled water, we indulged in hopes that the breeze would soon carry us into the North Water. This is a name given by the whalers to a space of water, which occupies the top of Baffin's Bay, and often extends considerably to the southward of Cape York. From the late period of the season we had good grounds for expecting this water to have made favourable advances to the southward; but the recollection, that winds had prevailed to a great extent which would go far to prevent such an occurrence awakened fears which were realised before mid-day, when the ice was again observed trending from the offing in the direction of the land. At nine o'clock the wind completely failed us; consequently, our weary crews had to turn out to their oars or the track-rope, as the case might be. From four o'clock in the morning till ten—for six hours—our attention was continually attracted by the thundering noise and convulsive motions of an iceberg, which happened to be crumbling to pieces in the act of changing its position in the water. It was of immense size, not less than two hundred and fifty feet

above the surface of the water, and half a mile in length and breadth. It could be compared to a cube, each of the sides of which would measure half a mile. The upper surface was perfectly horizontal, but presenting a rough pinnacled appearance, as if a number of rough irregularly pointed conical eminences, varying from twenty to thirty feet in height, had been closely planted side by side on it. The sides were perfectly perpendicular, and almost quite straight, but they appeared to be a little fissured, as if the depressions between the pinnacles had been continued a little downwards, in the form of cracks or narrow crevices. There appeared to be no foreign substance on it throughout its whole extent,—not even a single fragment of rock, to distract the eye from the universal whiteness or the azure tint which pervaded it. It is difficult to account for the pinnacles or "aiguilles," in the entire absence of all such substances as might, in proportion to their quantity, retard or facilitate the action of the sun. Agassiz attributes their presence to the inequalities of the rocky bottom over which the glacier has to move:—"La présence des aiguilles dans un glacier indique toujours un fond très-inégal sur une pente escarpée."* Professor Forbes also says, heavings and contortions of the surface of the glacier are owing probably to the

* See Agassiz, Etudes, chap. vii.

inequalities of its bed.* However, it does not seem probable that the comparatively small and numerous conical eminences on the top of this iceberg could have been owing to corresponding inequalities of the bed over which it had to pass while in the glacier; because the necessary relation between the top and the bottom, apart as they were, not less than two thousand feet, implies a degree of plasticity which would permit the ice at the surface to assume a perfectly level appearance.

On looking at the immense glacier range extending to the remotest part of the eastern horizon, and stretching from south to north over a space of nine or ten hundred miles, one can discern in little plots, twenty to thirty miles from the sea, in the valleys, and where the icebergs escape into the sea, exactly the same rough appearance as the top of this iceberg. There seems to be one invariable condition peculiar, if not also essential, to each plot; namely, a sloping descent, which exposes its surface less obliquely to the rays of the sun than the surrounding surface, where it is comparatively smooth. This was remarkably well seen on the glacier in the bottom of Hingston's Bay, where the ice from side to side of the top of the bay had a decided slope, until it entered the sea. From this, one can easily

* Travels through the Alps, 2nd edit. p. 75.

infer, that the action of the sun thawing the ice, and thereby establishing small streams on its surface, is the chief, if not the only, cause of these irregularities of surface. The indentations which may be observed on the southern side of icebergs which have been stationary throughout the greatest part of summer, will bear out such an inference tolerably well. But, in spite of these facts, which bear with more or less importance on the subject, the close analogy there is between the advancing glacier and a running stream, affords a substantial basis to the theory of Agassiz and Professor Forbes.

When the top of an iceberg presents such a striking appearance, one can have no doubt that the original surface of the glacier is still uppermost, and more especially when with this can be coupled the presence of water-lines showing the rise and fall of the tides in regular and horizontal lines, marking the exact limits of both the streams and neaps. Sometimes those lines may be seen dipping beneath the surface of the water, owing to a slight change of position of the iceberg; and they may frequently be observed with a considerable accumulation of pressed-up floe ice, occupying a height of perhaps one hundred and fifty feet above their original level.

When an immense iceberg begins to tumble to pieces and change its position in the water, the sight

is really grand, — perhaps one that can vie with an earthquake. Masses inconceivably great, four times the size of St. Paul's Cathedral or Westminster Abbey, are submerged in the still blue water to appear again at the surface, rolling and heaving gigantically in the swelling waves. Volumes of spray rise like clouds of white vapour into the air all round, and shut out the beholder from a scene too sacred for eyes not immortal. The sound that is emitted is not second to terrific peals of thunder, or the discharge of whole parks of artillery. The sea, smooth and tranquil, is aroused, and oscillations travel ten or twelve miles in every direction; and if ice should cover its surface in one entire sheet, it becomes broken up into detached pieces, in the same manner as if the swell of an extensive sea or ocean had reached it. And, before a quiescent state is assumed, probably two or three large icebergs occupy its place, the tops of some of which may be at an elevation of upwards of two hundred feet, having, in the course of the revolution, turned up the blue mud from the bottom at a depth of two to three hundred fathoms.

When we lost sight of this iceberg, or, I should rather say, of its ruins, a state of perfect rest had not been acquired. One-half of it had but turned over upon its side; so that the pinnacled top had

become the one side, while the bottom had become the other: and the other half appeared to have been reduced to three or four smaller masses, on the smooth parts of which muddy spots were distinctly visible.

When such immense quantities of ice are floating about in and on the sea in Baffin's Bay, one need not wonder at the low temperature of the water. We very rarely had it above 32°; and at that degree it would hardly effect a perceptible change upon the icebergs, although certainly it might dissolve the floating ice of the sea-water. The towering icebergs, over which the water exercises so little control in this latitude, are the store-houses of cold, carrying it into the depths of the ocean, and there concealing it from the searching rays of the sun.

The weather continued very misty and thick all day, and there was hardly any wind except very partial puffs occasionally from S. W. We could see the fixed ice between us and the land, and the loose ice on the opposite side, at the same time from the decks of the ships. Both the crews (not screws) were towing, tracking, warping, and heaving from morning till night (although it was difficult to say which was the one or the other), and if a nip came in the way, which was not an unfrequent occurrence, the saws were set to work; and, by assiduity in their

use, our progress to the northward was accelerated not a little. Captain Penny seemed to know by a sort of instinct when the saws were to be of any use in assisting to relieve a nip. On one occasion, after the ships had been moored securely to the ice, and the crews had turned in, expecting to have at least six or seven hours' rest, he went first to the crow's nest, and had a look around him, and thence to the nip. In a few minutes all hands were called, the saws were taken out, and in an hour and a quarter, after sawing one hundred and fifty feet of ice, the ships were hauled through and tracked northward, just as severe pressure was commencing where they had been moored but ten minutes previously. I asked him how he could have known, and by what rules he seemed to ascertain the exact changes the ice was to assume. His reply was, that he could not convey to another, in a few words, that which had cost him many years to acquire by experience alone.

July 19th.—After getting into a space of water which was tolerably free from ice, the watch was set, because the crews were completely exhausted. Indeed, I believe the best plan would have been, to have sent every man on board to rest for a few hours. And it is very probable that this would have been done as usual, but there seemed to be chances that we should be able to advance by means

of tracking, which, in calm weather and on good ice, half the crew did as well as the whole. Early in the forenoon we joined Captain Austin's squadron, and found it necessary to moor the ships, as the ice was so close that we could not advance any further. The weather continued very thick and foggy until evening, when it cleared up for a few minutes, giving us a glance of our true position, which was by no means encouraging. We discovered that the large floes were quite detached from the land ice, and subject to be drifted about by the winds and the advancing and receding tides.

Several attempts were made to get through, both by the ships and the steamers; but ice four to five feet thick, and of all superficial dimensions, from a square mile downwards, presented formidable resistance to the well fortified bows and powerful engines of the latter, and the thick and impenetrable fog completely foiled all the fearless attempts and stratagems of the former. It was found that the steamers could expedite ice navigation considerably by coming against the small floes in a nip with great force, and, having hooked some of the pieces with the ice-anchors, backing astern, dropping their load, and again repeating the shock, to back astern with some of the loosening fragments as before. By this I was reminded of what I had often witnessed in a whaler

under the command of Mr. Penny, which he often used as a huge battering-ram against the barriers of ice, when they appeared disposed to open. It was gratifying to know, that the engines of the steamers received no injury from what appeared to be such rough usage; more especially as the suggestion had proceeded entirely from Mr. Penny, who was at the bow of the "Intrepid" when the ice-anchors were fastened, and the ice was towed out for the first time, by reversing the power of the engines.

CHAP. VII.

PASSAGE THROUGH MELVILLE BAY TO CAPE YORK.

Great Detention. — Position of the Ships. — Agreeable Associates. — Plans for carrying on the Search.—The Use of Kites.—Gymnastics on the Ice. — Halkett's Boat. — Blasting the Ice with Gunpowder. — Ships drifting southward. — Young Ice. — Little Auks. — The Narwhal, its Food, Structure, Habits, Measurements. — Food for the Dogs. — Leave Captain Austin's Squadron. — Fog and Difficulties of Navigation. — Violent Pressure. — "Sophia" detained. — Intense Heat of the Sun's Rays. — "Sophia" getting clear. — The Land Ice.—Myriads of little Auks. — Lost sight of the other Ships. —Mean Salinity, Density, and Temperature of Sea-Water.—Peculiar Agitation of the Water. — Land Ice attained. — Bay Ice. — Boring among young Ice. — Bushnan Island. — Decayed State of the Ice. — Icebergs numerous. — Character of Bushnan Island. — Vegetation. — The Glacier Range of West Greenland. — Dangerous Position of the Ships.—Threatening Southerly Wind.—Close Approach to the North Water.

July 20th. — Our attempts to get clear proved unsuccessful: we had therefore to content ourselves among the ice, at the mercy of the winds and the tide. During the greatest part of the day a light breeze prevailed from the southward, accompanied by thick fog, and sometimes a sort of drizzling rain. The sky

was entirely overcast; and the clouds in the "wind's eye" had a very threatening appearance; but the barometer had been above its average during the preceding day, and it was rising; hence the appearance of clouds did not alarm us so much as it would have done without the valuable assistance of the barometer. The "Pioneer" steamer had to sustain rather severe pressure; and it was supposed at the time that some damage had been received: but of this there were no proofs. The other ships of the fleet were lying comparatively safe in angular openings among the floes. It was necessary at times, however, to shift their position out of places where the ice might be setting together into places of greater safety. The "Lady Franklin" was hauled into a dock that was cut out of a large floe; but it was not found necessary to dock the "Sophia," as she lay very comfortably on the sheltered side of a prominent point of a large floe, immediately to the northward of the "Lady Franklin."

July 25th. — The close state of the ice rendered it impossible to advance. At times it would slacken a little, and set us all in motion; but all our attempts were unsuccessful. Our prospects were very bad, almost as bad as they could be. The prevalence of southerly winds would, to a certain extent, prevent drifting down the Strait; but this was of little im-

portance, when we could not get clear of the ice on the other hand.

We associated occasionally with the officers of Captain Austin's squadron; and the reciprocal kindness which seemed to run through the whole fleet, from the commanders downwards, was such as one might expect to produce lasting impressions. It was only what one could look forward to: for humanity lays no yoke upon any person; and in her devoted train there are none whose services do not proceed from the entire and unsolicited assent of the heart. In all our intercourse we appeared to be spell-bound by a universal fellow-feeling, which seemed to increase with our increasing intimacy.

The commanders of the two expeditions often met and arranged their plans of search, making them all conditional on the state of the ice as the season advanced. In no part of the world are the preconcerted schemes of men more likely to be thwarted than in the Arctic Regions, especially if they extend far beyond the Arctic Circle. Two hours of a south wind may undo the laborious exertions of as many months; and that is not a casualty, but a common occurrence. Any one that has been in Davis Strait has learned not to lay plans for to-morrow while there. Such a general rule could not but apply to the plans of Captain Austin and

Mr. Penny; they were therefore reduced to mere or faintly probable outlines, which the first northerly or southerly wind might confirm or scatter.

Captain Austin said "(D. V.) If we get through Melville Bay in season for it, I intend to go down as far as Pond's Bay with the 'Resolute' and her tender, the 'Pioneer,' and there to commence my search to the northward and westward on the south shore of Lancaster Sound, until I reach Prince Regent's Inlet and Leopold Island, where I expect to fall in with the 'Assistance' and her tender, the 'Intrepid,' after they have explored the north side of the Sound as far as the entrance of the Wellington Channel; and, having met, we will compare notes. If we shall not have discovered any traces of the missing ships, we will, if the season and the state of the ice prove favourable, endeavour to penetrate to Melville Island, there to winter. But of course, in this plan, as in all others, we must be guided entirely by circumstances which at present no man can foreknow. And if it should happen to be impossible to accomplish this route in its several departments, our actions must be according to the best of our judgments, taking care to be in winter quarters by the 11th of September at the farthest." Mr. Penny said it was his intention to explore Jones Sound, and, if practicable, to penetrate

through it into the Wellington Channel, where he would expect to meet H. M. S. "Assistance." Failing in this plan, from accumulations of ice and other possibilities, he would require to use his judgment, and endeavour to be guided by such circumstances as would tend to throw most light upon the route of the missing ships. He recommended to Captain Austin to take one or two Esquimaux on board at Pond's Bay, to assist an exploring party in some of the intricate channels or inlets on the south shore of Lancaster Sound. He also recommended to Captain Austin to put despatches into the hands of the Esquimaux at Pond's Bay, who might be intrusted with them until they should find an opportunity of sending them on board the whalers, which might take a run up in that direction along the west coast of Davis Strait, after making the land about Cape Searle. He mentioned the name of an Esquimaux (Toonic) whom he had always found highly trustworthy, having known him for a number of years.

July 31*st.*—During the time that we lay here, an opportunity was afforded for a trial of kites in dragging boats and sledges. In smooth water, with a four-knot breeze, a larger-sized kite, with plenty of line, would drag a whale-boat before the wind, at the rate of about two miles an hour. And on smooth ice, although covered with snow, a single kite dragged

Mr. Petersen's dog-sledge, with one man on it, during a smart breeze, at the rate of two miles an hour; but, like the boat, it was dead before the wind. In using kites for dragging sledges along, there will be no difficulty in getting them up, for one can run upon the ice with them until they are fairly on the wings of the wind. There is, however, for using them in boats, a serious objection in the difficulty of getting them afloat; hence I do not believe that they can ever be used for that purpose. For sledging I think they may suit, although, perhaps, not to the extent that one at first sight would be led to suppose.

Many times after the duties of each day were over, the officers of both expeditions engaged in gymnastics on the ice, and frequent were the tumbles they got among the snow It was a sure sign of good health and high spirits, although, I must say, the spirits of some were beginning to feel the effects of disappointed hopes. Our expedition was much indebted to the kindness of Lieutenant Sherard Osborne, commander of H. M. S. "Pioneer," for supplying us with one of Halkett's india-rubber boats, which belonged to himself. We did not stand in need of it at that time; but, in the event of having to travel over ice after the season was pretty far through, I had no doubt it would be of invaluable service.

Blasting the ice around the ships of Captain

Austin's squadron was sometimes had recourse to, but not with great advantage if the ice was pressing together. If, on the contrary, it was opening out, a charge of two or three pounds frequently imparted a shock to it which facilitated the slackening process, and enabled the ships coming against it to force it out of the way. It was believed to be very useful in relieving the pressure which a ship might be sustaining between two entire sheets of ice, by reducing them alongside the ship to a state of pack. This, however, requires to be confirmed, for there happened to have been but little pressure in Melville Bay this season, to affect a single-bottomed ship; and, of course, far less so, those of Captain Austin's squadron, which were said to be as strong as wood and iron could make them.

August 1st.—The prevalence of southerly winds kept the ice very close, so that we always found it impossible to advance. The ice opened occasionally, but never sufficiently to encourage our anxious efforts to extricate ourselves. It was really tantalizing to have to behold extensive lanes of open water between us and the land, where the ice appeared to be fixed. The latitude was 75° 25′, but it varied about two miles every day, which we lost by drifting to the southward. The longitude was 61° 40′, but with respect to it there was no variation for nearly a fort-

night; we could almost always see the land to the eastward and northward. Sabine Islands were but a few miles to the eastward; but no one ever attempted to pay them a visit, although the journey might have been accomplished in two days. There was an objection to it in the lanes of water which intervened. It was surmountable, however; for active persons can make their way remarkably well over ice in which there is a good deal of open water. By a system of leaping from hummock to hummock across the narrow lanes and by ferrying across the wide ones, one gets on very fast, but a boat-hook or boarding-pike is necessary. It is very hard work, but excellent exercise. We had too much time for exercise of this kind, in the absence of such work as towing and tracking.

Young ice formed every night in the lanes of water around us, although the temperature was rarely below +32°. The temperature of the water was sometimes so low as 30°, and very rarely above 31°, except when a quantity was taken up from the surface of one of the lanes during bright sunshine. Of course, the temperature noted would not be the mean temperature of the water at the time. We had every reason to believe that the temperature of the water was as low as it could be in proportion to its saline constituents. As Captain Penny and Mr. Stewart were walking over an extensive floe, about five feet thick, they came

to a hole in it about two or three feet in diameter. It appeared to have been a hole which a seal had kept open during winter. On looking into it a portion of ice was observed extending from side to side, and closing it up about three feet below the surface of the water, and one foot above the under-surface of the floe. It was removed with their boat-hook or pole; and on their return, three hours afterwards, a second accumulation of newly formed ice occupied exactly the same place, and cut off all communication between the water in the hole above it and the sea beneath. They had various conjectures as to the cause of this unusual feature in the process of congelation. I believe it arose from the comparatively fresh water passing by a process of percolation from the surface of the ice, where the high temperature during the day had set it free, into the sea-water beneath; which, owing to its low temperature and degree of salinity, was not capable of maintaining even a small quantity of fresh-water in a fluid state without a part of it becoming congealed. For example, the temperature of sea-water may be 29°, and its degree of salinity such as to maintain it in a fluid state; if a portion of the saline matter be removed, congelation is sure to follow. Precisely the same thing occurs by a small quantity of fresh-water at 32° being added to a large quantity of sea-water at 29°; a part of

the water at 32° becomes congealed, because that degree of salinity is not attained by the admixture which will enable the whole to maintain its fluidity. It appears rather strange, that the ice dissolving upon the upper-surface by the action of the sun should be congealing on the under-surface.

Immense flocks of rotges were continually seen, flying north or south according to the direction of the wind. They generally fly against the wind, where they are sure to find open water. Their flight is invariably high over a tract of ice presenting no lanes or pools of water to receive them. In consequence of the closeness of the ice around the ships, our sport among them was not very extensive. Captain Stewart on one occasion travelled a few miles to a large angular opening, where they were very abundant, and succeeded in shooting a great number. He brought down twenty to thirty at every shot. The rotge is excellent eating, and is highly prized by every taste. I have heard the eider-duck, and the long-tailed duck, and even the loon, denounced by persons whose tastes were really fastidious, but I never heard a word against the little auk. Its flesh, and that of sea-fowl generally in the Arctic Regions, improves very much by keeping for a few weeks after being shot; indeed, it is not uncommon to use them after they have been three

months hanging to the booms around the ships' quarter.

Narwhals (*Monodon monoceros*) were very abundant in the angular openings close to the ships, and their short-breathing blasts could be heard at every hour of the day and night. We often endeavoured to capture them, but in this respect we were very unsuccessful, although one was obtained. Mr. Ward, surgeon of H. M. S. "Intrepid," shot one dead upon the spot, with an ordinary rifle. It did not sink; he therefore succeeded in securing his prize, won by such mere chance.

One of our men fired a gun-harpoon into a large female. She took out about thirty fathoms of the whale-line, and then died. Immediately after this beautifully spotted mammal of the deep was dragged out of the water upon the ice, a thermometer was plunged into its thorax through an opening made for the purpose. It rose to + 97°, although the medium in which the creature had been living was nearly seventy degrees colder by the thermometer of Fahrenheit. The blood, as it issued from the wound made in the chest for the thermometer, was very dark, but the moment it became exposed to the air it assumed a bright florid colour. This appearance was instantaneous when a quantity was poured into the sea before coagulation had taken place. There is

on its back, at a point opposite the spine, a hardening of the skin and subjacent tissues, which resembles the rudiments of a dorsal fin. The stomach was found to contain about half a bucketful of half-digested matter. I could easily recognise fishes of two kinds (very probably the *Merlangus polaris*, and either the young of *Hippoglossus vulgaris*, or a small variety of the same species), abundance of crustaceans, and hundreds of the horny beaks of the cuttle fish. The lining membrane of the stomach was exceedingly vascular; and if one were to measure its prodigious extent, it would be found spread over a very wide space. It is remarkable how perfect the digestive apparatus was, even to ordinary observation; commencing with the stomach and following the whole digestive tube to its termination, where the diameter is less than half an inch, one has a decided proof, that almost all the food of the animal is intended to be received into the system as elements of nutrition. It does not necessarily follow that, because an animal is of very great size, its food must be in the same proportion to its bulk as that of much smaller animals. On the contrary, the proportion of food diminishes according to the increase in size of the animal. A perfect state of the assimilative organs, accompanied by great inaction of all the processes of excretion, accounts most satisfactorily for the immense bulk of the cetacea.

The skin of the narwhal is about half an inch thick; and, like that of all the cetacea or whale tribe, it is highly prized by the Esquimaux as food, and by the Danes as an invaluable antiscorbutic. The extensive and beautiful net-work of capacious veins, arranged in front of the spinal column, within the thorax, shows very clearly the reservoir which relieves the lungs and the brain when the animal has to remain under water. The quantity of circulating fluid is so great, that perhaps two-thirds of it can be stored up in this way, charged as it is with the waste of the tissues. There can be no doubt whatever, that this slow condition of the function of the lungs is essential to the development of the accumulation of fat which is found immediately beneath the skin. Again, the rapid motions of the animal in the water would yield an enormous amount of heat to the surrounding medium, were it not for the non-conducting property of the fat, which is wisely laid up in store where it is most required. The skin, as well as the fat, conducts heat very slowly, and becomes equally important in preserving the warmth of the animal. The functions of the tooth or "horn," as it is generally called, of the male narwhal are very doubtful. It is very probably one of the numerous marks which distinguish the sexes. The Esquimaux, however, believe it is of essential importance in stirring

up the food of the animal at the bottom. Were this true, we asked, how are the females, which are destitute of such weapons, to obtain their food? By feeding upon what the others have sedulously stirred up for them, was the reply. It would be well for the wives of the Esquimaux, and perhaps also for wives in more civilized communities, that the example of the fond narwhal were followed.*

One can easily conceive what a hearty meal the narwhal proved to our hungry dogs. The

* Measurements of a female Monodon killed in Melville Bay, July 31st, 1850:—

Length along the back, from the tip of the upper jaw to the fork of the tail	13 ft.
Girth immediately behind the fins	7 ft.
From the eye to the angle of the mouth	8 in.
From the angle of the mouth to the tip of the under lip	7½ in.
From the eye to the ear	5 in.
From the eye to the base of the fin	18 in.
Fin from the body to the tip	17 in.
Tail from tip to tip	37 in.
Fork of the tail to the anus	5 ft.
Mammæ posterior to anus	2 in.
From the umbilicus to the fore part of the vulva	25 in.
From the lower lip to the umbilicus	6 ft.
From the eye to the spiracle	15 in.
From the tip of the upper lip to the fore part of the spiracle	20 in.
Spiracle in length	3 in.
Thickness of blubber	3 in.
Thickness of skin	½ in.

poor brutes were faring very ill on board ship, for their principal food since we got them consisted of vegetable matter. However, they appeared to be in good condition, and gave promise of usefulness in the sledge when their service might be required. They ravenously devoured whole masses of the flesh and the skin, and lapped up the blood from the floe. Some of them afforded most evident proofs that it suited their tastes, for they ate the same twice or three times in succession. After it was flensed, and a great part of the flesh had been removed, they were permitted to exercise their teeth upon the bones. It was not unusual to see one or two of them, all besmeared with blood and oily filth, sticking joyfully among its ribs, determined to keep possession as long as there was anything worth having.

A snow-bird was observed occasionally among the hummocks, but it never ventured to approach the carcass of the narwhal, although it had frequent opportunities to do so with perfect safety. It is not at all probable that the ivory-gull feeds upon such highly developed animal tissues as that of the cetacea; fish, and perhaps also crustacea, picked up among the ice, seem solely to constitute its food.

The close state of the ice prevented the ships moving with anything like freedom, even when partial openings took place among it. We soon dis-

covered that the large ships of Captain Austin's squadron were anything but a match for us among the ice, even with the invaluable assistance of steam. It was not without the greatest reluctance that we increased the distance between the two Expeditions, as both ships and steamers stuck fast among the ice. It was a source of pleasure to us, to see their smoke getting up, as we expected them to join us in a few hours. But our hopes were invariably disappointed; for the ice always closed in around them, and brought them to a stand, in spite of all that steam and gunpowder could do to set them free. The wind occasionally came from the land, and opened out the ice so much, that we could make use of our sails, which was exceedingly agreeable. At such times, our progress was very much retarded by fogs, which lay close along the horizon, and obscured vision so much, that objects could not be discerned at a distance of two hundred yards. By ascending to the crow's nest one could get out of it, and command an extensive view of a sea of fog, in which icebergs appeared to rise as if out of the water, and the ships could be distinguished only by that portion of their masts which rose above it. This condition of the atmosphere was a serious obstacle at all times. Had we been at the fixed ice, it would hardly have been any obstacle; for the free border of the ice

would have led us, to a certainty, as safely as if the weather had been clear.

Davis Strait rarely presents this difficulty to navigation early in the season. It only comes on after midsummer, when there is open water and drifting ice over all the Strait, and the consequently abundant evaporation becomes condensed towards midnight by the cold, which is the result of the increasing obliquity of the sun's rays. It was always observed, and noted in the meteorological registers, that fogs prevailed much more frequently during the night than the day.

August 3rd.—The wind for two or three days prevailed in gentle breezes, from the northward and eastward; and, under its influence, the ice opened out decidedly, and enabled us to advance, although the constant presence of thick fogs was a serious obstacle to sure and rapid progress. I venture to say that some large floes had been circumnavigated. Captains Penny and Stewart, with Messrs. Manson and Marshall, and every person in our Expedition, had but one opinion, that the sooner the land ice to the eastward was reached, the sooner would we begin to make our progress through Melville Bay at such a rate as to complete it this season. Consequently, our course was eastward, every time the ice favoured

our movements. The usual routine of warping, heaving, sawing off points, tracking, towing, and making sail three or four times every day, was followed out very closely. A minute detail of every thing done on board for a week, would shew how exceedingly little variety there was in the duties of every day. It was not unfrequent to have every person on board busily employed for four-fifths of the time. These are long hours, especially when the work engaged in is such as to induce profuse perspiration.

At an early hour this morning, the "Lady Franklin," always leading, got into a lead which closed upon her, and caught the "Sophia" a few yards astern. The pressure continued, but it changed its character a little, for it was opening ahead of the one ship, while it was pressing closely together astern of the other. With some little difficulty, our rudders were unshipped, and preparations were made to receive the pressure, however severe it became. In a few hours, the "Lady Franklin" got clear, but the "Sophia," instead of getting clear also, was raised nearly three feet above her usual water-lines out of the water; and, to show that there must have been a little twisting of her quarter, the door of my little cabin would neither open nor shut to the fullest extent, without a violent effort. Towards night, the pressure eased off a little, and excited hopes that very

soon we would be permitted to follow the "Lady Franklin," which appeared to be waiting patiently, but anxiously, for our release. Our hopes were not realised; for, during the remainder of the night, the ice hardly moved one way or another.

August 4th.—The barrier was carefully watched, so that we might be in readiness to embrace the earliest opportunity of getting through it. Although it did not fall to my lot to have to observe its motions, I could not help participating in the interest which all seemed to take in it. How tantalising is it to find a barrier opening a few feet, then remaining quiet for two or three hours, after which a slight motion is discovered, but too slight to reveal whether it is favourable or unfavourable; a mark is applied, and, after one is absent for six hours, it may shew that only as many inches have been gained.

A small ice-saw was obtained from the "Lady Franklin," and with it some points were sawed off to facilitate our progress through the barrier, after it should open sufficiently to encourage a daring attempt. The crew were not called out to the saw, as it happened to be what the whalers call a "whip saw," and could be used with great advantage by three or four men. It was gratifying to know that the men, who greatly required it, were getting a good spell

below, which would prepare and arm them for a renewed and desperate struggle with the ice.

The thermometer, freely exposed to the rays of the sun, and placed at right angles with them, rose to + 90° at noon, and + 96° at three P.M., on the 2nd; to + 78° at six P. M., and + 60° at nine P. M., on the 3rd; and to + 94° at noon, + 94° at three P. M., and + 74° at six P. M., on this day. The temperature in the shade, at the same hours, gave a mean of 50° colder; the minimum difference being 32°, and the maximum 60°. Supposing the weather to have been perfectly clear during a whole day, the indications of a thermometer, exposed freely to and at right angles with the rays, registered every hour, would afford materials by which a curve could be projected, whose two culminating points would correspond with noon, and zero with midnight. But it is impossible to have the weather so clear as to afford such results; consequently, one will often find the exposed instrument much higher at other hours than at noon: in this respect, its indications are brought into a degree of relation with those of the one altogether in the shade. I mention these facts to shew, that, although the men had to engage in their work among ice, still it was not such cold work as the chief feature in its character might lead one to suppose, and that the quantity of perspiration which flowed from their

skin might be made a measure of the clearness of the weather, or of the sun's altitude, as well as the exposed thermometer or the actinometer.

August 5th.—At nine A. M. the barrier of ice began to give hopes we should soon be released from its powerful influence. All hands were called immediately, and our work was commenced forthwith, although as yet there was not enough room for the ship to press through. The portions of ice that had been sawn off, and other loose pieces, were drifted into the widest parts of the nip, to make as much room as possible. At ten A. M. the "Sophia" was started and moved onwards: in many parts there was hardly room for her breadth; however, by angling and entering fair, she advanced about a quarter of a mile. The nip began to close astern, and in ten minutes the ice was squeezing together where we had been lying half an hour previously. It came together a little ahead too, as well as astern, and, from the presence of a small piece with a long projecting tongue, we apprehended the "Sophia" would be again caught. The saw was applied, but it stuck fast in the fissure it had made, and was nearly lost. At length, by the untiring efforts of the crew under the command of Captain Stewart and Mr. Manson, she got clear, and was towed with three boats in the direction the "Lady Franklin" had taken; and at

seven P. M., after nearly six hours of incessant towing, we came up with her, and made fast to a large floe, which, with others of equally large dimensions, lay chained along the west side of a large space of open water, which extended right round Melville Bay at the edge of the fixed ice. But one nip, or barrier, the point of junction of any two floes, lay between us and this water; however, it was very extensive, as each floe was from two to ten miles in circumference, and perhaps even much more.

Captain Austin's ships were about eight miles to the S. W. of us. There appeared to have been no change in their relative positions since we left them, except that the "Intrepid" had separated to a greater distance from the others. Mr. Penny had been signalising, to Captain Austin, the good prospects there were, if the land ice could be attained. Two small schooner-like vessels were seen about fifteen or twenty miles to the southward, and it was supposed they were the "Felix," under the command of Sir J. Ross, and another small vessel, which we heard was fitting out for Prince Regent's Inlet, when Captain Austin's Expedition left England.

August 6th.—It was deemed advisable to change our position for a better one about ten miles further north, where a barrier, only a quarter of a mile in breadth, lay between us and "the water." The

weather was remarkably favourable; the sky clear and serene, with scarcely a cloud upon it, the water as smooth as possible, and covered with myriads of the little auk, but occasionally ruffled by a gentle breeze from E. or S. E.

The latitude at noon was 75° 48′, and the longitude 62° 14′. Our last shift of position increased the distance between us and the other ships so much, that they could hardly be discovered from the crow's nests. While we awaited the opening of the ice, one or two boats were sent to shoot rotges. It was evening; and, as young ice formed on the water as soon as the sun's rays began to fall too obliquely, they could be seen flying north or south, wherever the tide might happen to be passing away from the fixed ice, carrying along with it the young ice, and leaving water free from any impediments to them. I have often seen a poor little rotge, struggling in a small hole in young ice, which was too weak to support the creature altogether, but sufficiently strong to hem it in on all sides, and prevent the impetus in the water which such a comparatively heavy little bird requires before it can rise from the water. Although they were deserting the ground in this manner, several hundreds were obtained in a few hours.

August 7th.—Every return of this day ought to

awaken grateful feelings in our minds, in connection with Melville Bay. A gentle breeze sprung up from E. N. E. at an early hour, which shifted the position of the large floes so much, that before eleven o'clock the barriers opened out, and our ships were once more in open water along the land ice. There was a good deal of bay ice close to the drifting floes, but it became weak, and consequently less troublesome, as we approached the fixed ice. It was a source of deep regret to us, that the other ships were not here also; had they been so, how well the steamers would have done, in such calm and easy weather, in this extensive and apparently boundless sheet of water! Great numbers of the harp-seal (*Phoca Grœnlandica*) could be seen on the floes. They were remarkably wary, never permitting a boat to approach within rifle-shot. But there was no difficulty in distinguishing them, from every other species of large seal, by the variegated colour of their backs.

By towing with the boats, and by sailing when there was wind, we reached the land ice, and commenced tracking to the northward with only half the crew of each ship. The edge of the ice was generally very smooth, about four and a half or five feet thick, and it led away in the direction of Cape York. It was observed that the ships steered very badly, when their progress was slow. The water around

them seemed to be in a state of agitation, appearing as if an atmosphere of it would move along with them, in the form of miniature whirlpools and eddies. This seems to depend upon the density of the water, which must vary according to its temperature, and its degree of salinity. The process of congelation during winter furnishes the surface of the water with a layer of ice, comparatively free from saline matter; which, on being thawed, will yield a layer of fresh-water, varying in depth according to the thickness of the ice, and will probably remain on the surface until agitation mixes it with the water underneath. And when the surface of the water is in some parts freely exposed, and in others protected by ice, it must be heated unequally by the action of the sun, which also causes such a difference in the density, as requires commotion to restore it to its equilibrium. The tides in the sea must prevent and obviate these differences of density, by keeping it constantly in motion; and I have no doubt they do so to a certain extent, but not sufficiently to conceal them entirely from observation. Let a person stand upon the edge of the fixed ice, after it has begun to show that the action of the sun has already raised the temperature of the water, and he will observe a constant stream issuing from beneath the ice, which at first he will confound with the receding tide; but

if there be a fragment of loose ice, drawing even a few feet of water, within half-a-dozen yards of him, he will be astonished that the distance between it and the fixed ice is never increasing under the influence of what appears to be a very rapid tide; and he will have a convincing and unequivocal proof, that the commotion in the water is for no other purpose than to restore the mean density, which had been disturbed.

August 10th.—We experienced great annoyance and hindrance from the bay ice, which formed every night, and acquired great strength by overlapping, as it always did during the advancing tide, when the water on which it had formed became diminished in extent. The water was, to say the least of it, covered with little auks, which were so tame, that a boat could go dashing in among them, and kill scores with boat-hooks and oars. In shooting them, there is a good deal of tact displayed by the sportsman, in keeping at the greatest distance at which they can be killed, for then the charge of shot is well scattered among them; it is also proper to stoop as low as possible, so as to send the charge raking among them. I have no doubt, in this way, one shot might kill fifty or sixty.

At times, we had favourable winds from the eastward, which enabled us to advance in spite of the

young ice. We found that our ships suited for "boring" among it particularly well; the great obliquity and sharpness of their bows seemed to be perfect in that respect. Although the inertia of the "Lady Franklin" was nearly twice as great as that of the "Sophia," the latter appeared to "bore" with greater ease, and to advance more rapidly, than the former. This must have been owing to some peculiar difference in the form of the bows; that of the "Sophia" being a little oval as well as sharp, while the "Lady Franklin's" was almost wedge-shaped.

Yesterday, in latitude 76° 5′, we passed whole cities of icebergs, clustered together in the form of formidable fortifications, which the ships dared not approach, with the view of passing between them. Many of them appeared to be afloat, which was the source of the dangers we apprehended. One was observed of great dimensions, with one of its sides rising (not quite vertically) out of the water, to a height of about one hundred and fifty feet, from which the flat top sloped gradually, until it dipped beneath the water; the other two sides presented the form of a triangle. But the most singular phenomenon that I witnessed in Davis Strait, was the distance to which a floe, about four or five feet thick, had been pressed up its sloping top. It would have been a grand sight, to have beheld the ice descending perpen-

dicularly in the form of a cascade into the water, from a height of thirty to forty feet on one of the sides.

At six o'clock in the morning, we came to a barrier between the loose floes and the land ice, about seven miles south of Bushnan Island, in latitude 76° 10′ and longitude 65°, where we had to remain some time. A party, of which I happened to be one, went ashore to the island. The ice over which we had to pass was full of holes, which communicated with the water underneath. It seemed to have been much more decayed than the ice in the middle of the Strait, or the ice we had been tracking upon for nearly a week before. The ice in the middle of the Strait generally moves with the tide, which saves it very much from the dissolving action of the water. The ice in the bottom of Melville Bay, where we had been tracking during the last five or six days, from the disposition of the surrounding land, receives the tide underneath it in an entire wave, which fills up the bay without establishing rapid currents in any part; and thereby it is saved, in a great measure, from the action of the water, which is so remarkable in dissolving it where the tide is rapid. The tide appears to sweep to the eastward into Melville Bay, along the land of which Cape York is the western point, and around Bush-

nan Island. The decayed ice in this part may be accounted for by the probable rapidity of the tides. However, it is also very probable, that the action of the sun's rays, rendered intense by powerful reflection from crowds of icebergs, and coupled with radiation of heat from the land, is the chief cause of the wasted state of the ice. The ice had shifted its original position, and a wide crack was the result. It came exactly between us and the island, and threatened to disappoint our hopes of ascending its rugged sides. A piece of loose ice was discovered in it, on which we ferried across with our boat-hook, and, in another half-hour, we were clambering over the rocks. We ascended to the highest part of the island, where there is a large cairn, which I believe was first built by Sir J. Ross, in 1818, since which time it has been frequently visited by the whalers. Its height above the sea is about eight hundred feet, on the south-western part of the island. From nearly W. to S. S. E. the island presents a bold and almost perpendicular front, which appears to be surrounded by deep water. And, from nearly the same point, it slopes gradually, but very irregularly, to the eastward. The rocks are almost entirely metamorphic, although granite can be detected, at the south-eastern extremity, a little above the level of the sea. Here disintegration goes

on very rapidly from the melting snow, running water, intense frost alternating with heat, and the action of the ice at the water's edge. Vegetation was very far advanced. In some parts, especially the southern slopes, it was rather luxuriant. The *Andromeda tetragona* was beginning to fade; a specimen or two in bloom was obtained in a shaded spot. There was a whole array of Arctic plants. The well-known yellow Arctic poppy (*Papaver nudicaule*), one or two varieties of creeping willows, several grasses ten or twelve inches in length, the *Alopecurus Alpinus*, and hosts of Cryptogamic forms could be recognised.

We commanded a splendid view in all directions. On the one hand, there was abundance of open water, stretching away to the west and north-westward, Cape York, and Baffin's Bay, with its impenetrable covering of ice drifting imperceptibly to the southward. On the other, were Prince Regent's Bay, Cape Melville, Melville Bay, and an extensive glacier range, lost on the most remote part of the horizon, over one-half the compass, stretching to the southward for upwards of nine hundred miles, pouring forth magnificent ice-bergs, through the deep valleys between the islands, which in many parts could be seen, at elevations of perhaps a thousand feet, cropping out in this adamantine but withal moving sea. At Cape Farewell,

Mr. Petersen says, the glacier is very far inland, and the icebergs to which it gives birth rarely or never reach the clear and open sea, for they become dissolved or broken up in the deep fiords, which so deeply indent that part of West Greenland. At and beyond Cape York, the glacier ventures to the outside of an imaginary coast-line, drawn from one prominent point to another. From Cape Farewell to Cape York, we find the land free from ice gradually diminishing in breadth, until, at the latter, it almost entirely disappears beneath the overwhelming glacier. Although the glaciers in Greenland do not, like those in the Alps, intrude themselves into fertile valleys, and overthrow trees and houses, lay waste the meadow and garden*, nor afford an origin† to magnificent rivers, which have to traverse continents and flourishing empires, before they reach the ocean, the words of Agassiz are not the less applicable to them than to the others, when he says, "De tous les phénomènes de la nature, je n'en connais aucun qui soit plus digne de fixer l'attention et la curiosité du naturaliste que les glaciers;" nor less so are those of the poet quoted by Professor Forbes‡:—

* Travels in the Alps, by Professor Forbes, pp. 33, 34.

† Agassiz, Etudes sur les Glaciers, Preface.

‡ Travels, &c., p. 17.

"Where so wide,
In old or later time, its marble floor,
Did ever temple boast as this, which here
Spreads its bright level many a league around."
Dyer's Fleece.

and although there are circumstances connected with their descent which cannot be present in the Alps, there is no doubt but that equally extensive travels and researches in them would prove the analogy of the laws by which both systems are governed. After the season has advanced far beyond midsummer, the march of the glaciers increases in its progress, and thousands of huge icebergs are set free in the months of August, September, October, and November, owing, perhaps, to there being open water generally at that time along the coast which they have to traverse. The Esquimaux around Disco Bay visit, during winter, the foot of an advancing glacier of very great height, in the neighbourhood of Clous-havn, where they find abundance of very fine halibut, which they draw from a depth of three hundred fathoms. They often observe, during these visits, that the advance of the glacier during the last months of spring is considerably slower than during the last month of autumn and the first months of winter. It seems very probable, that when the icebergs are set free their detachment does not happen by a process of gravitation, which precipitates them into the

water, but by a process of flotation, which is the result of stream tides. From the continued prevalence of south winds, after a large body of water has opened out along the coast, and in the top of Baffin's Bay, there will be an influx of water into all the fiordes to the foot of the glaciers, which will facilitate the removal of the icebergs in the autumn. The immense glacier range in Greenland has not received that share of attention from geographers and travellers which such an important subject deserves. Neither the Esquimaux nor the Danish settlers ever do much more than visit the foot of them. Attempts have been made by both to explore those situated at the tops of some of the most accessible fiordes, but the gaping crevasses, which came so frequently in their way, proved an obstacle which their spare means, at so great a distance from the settlement, could never overcome.

On looking to the southward into Melville Bay, and examining it most minutely with a telescope, Mr. Goodsir could see nothing of the ships we had lost sight of on the 6th in the drifting pack. We expected, however, that the winds and easy weather which had favoured us so much, would also favour them, and enable them to follow at "full speed." When the ice first began to open out on the first few days of August, enabling us to advance faster

than they did, it was frequently discussed whether we ought not to continue in company with them until they too should get clear. Their course was plain; they had but to work in towards the land ice, and as Mr. Penny knew that Captain Austin had experience enough during the previous month in Melville Bay to impress him with the extreme importance of regaining the fixed ice, and remaining by it until he should get into the north water, he felt that he could not be of any assistance to them, and that the search for the missing ships might be suffering from his neglecting to embrace every opportunity to advance.

The prospects of getting to the west side of Baffin's Bay very soon were as good as they could be if the wind would but favour us. Only one or two, or, at the most, three, barriers lay between us and the water in the top of the Strait, and the first change of tide might lay them all open.

We descended from the top of the island and made the best of our way to the ships. The crack in the ice presented the same obstacle as before, but our boat of ice had not run away; by its assistance we ferried over as before, and soon reached the ships. We found that Mr. Penny, Mr. Stewart, and Mr. Petersen had also landed upon the island.

The first nip or barrier occurred where two huge icebergs lay between the fixed and the loose ice.

They were close together, a few feet under water, from which point they ascended on both sides like an enormously deep arch, inverted, with its sides parallel and sometimes overhanging. The slightest motion of either might leave the ship high and dry. There were chances, too, that we might get aground on a part of it if the tide was receding. The depth of water could not be ascertained correctly, for it presented a kind of nodular or angular surface under water. There was some loose ice in it which was soon cleared away. In this instance the "Sophia," drawing less water than the "Lady Franklin," went foremost, and got through safely in a quarter of an hour; but it was a long period in such a frightful place. In less than half an hour both ships were moving along by the track-rope, as the weather was quite calm.

August 11th.—Last night, and early this morning, the sky became deeply overcast with a dense and misty haze, which, in some parts, resembled the ordinary nimbus cloud. On the southern horizon and sky, which the whaler always watches with the deepest interest, and often great suspicion, there was a blue appearance which threatened to be the precursor of a gale from that quarter. The barometer was scarcely one-twentieth of an inch below 30°; hence our fears of an approaching gale were but slight, in spite of the threatening appearances of

the atmosphere. The temperature of the air was rarely above +34°, and that of the water never above 32°, it being generally about 31°.

A gentle breeze from about south, which sprung up about six in the morning, soon brought us to the second barrier, which was very soon cleared; and, after advancing a few miles further, the third and last barrier brought us to a complete stand, for it was nearly a mile in length, and guarded at its further extremity by an enormous iceberg which jutted out of the fixed ice. Towards noon the weather was very thick, and there was some flaky snow falling densely around us; the pack, impelled by the south wind, began to squeeze a little, but we endeavoured to keep the ships clear. At night it was nearly calm, but still very thick. The fog seemed to extend to a much greater height than usual, for it was much darker than any we had experienced for a long time. The little auk was very abundant in an opening that formed by the tide between the fixed and the loose ice. The chirping little things would not be frightened, although a boat was continually pulling among them on its way to and from the opening barrier which was by this time beginning to be confined to the iceberg alone. Being Sunday, no shooting was allowed, otherwise the rotges would not have enjoyed such uninterrupted pastime in all directions around us.

CHAP. VIII.

PASSAGE FROM CAPE YORK TO THE WEST SIDE.

Opinions respecting Melville Bay.—Arctic Highlanders. — Favourable Wind. — An Attempt to push Westward. — Off Cape York. — Glaciers at Cape York. — Genial Appearance of the Land. — Red Snow. — An Esquimaux Report with respect to the Missing Ships. — An Investigation. — H. M. S. North Star. — York Ommanney. — Wretched State of the Natives at Cape York. — Parting of the Expeditions. — The Beverly Cliffs. — Calm and Foggy Weather. — Centipeding. — Narwhals and Sharks. — Little Auks and their Food. — Crossing the Top of Baffin's Bay. — Middle Ice. — Currents in the Polar Seas.

August 12*th.* — At two o'clock in the morning, the barrier removed, all hands were called, and as there was no wind, the ships had to be taken in tow. The ice, leading in the direction of Cape York, was much decayed; and moreover, it tended too much to the eastward to serve the purpose of tracking. As we got round the west side of the iceberg, the ships, just merging into the "north-water," bowed and nodded gracefully to the swell, which, in the absence of every other sign, even in the thickest fog, would have been a sufficient proof that a large extent of open water

was close at hand. Let a person but look at the chart or map, and he will see that the circuit we have made of Melville Bay is at least half as long again as a straight line, drawn from the usual position of the edge of the fixed ice, opposite the southern limit of it and Cape York. But in addition to being so much longer, which is to be attributed to no other cause than the broken-up condition of the ice, it is in an infinitely greater proportion more difficult, and so protracted, that, instead of coming through it in a few days, as we might have done early in the season, we were five weeks in it. Surely it must be plain, that to make a quick passage through Melville Bay and before the end of August, it must be attempted before the ice has begun to yield along the land to the increasing power of the sun's rays and the action of the water. It was nearly calm all day, and the sky was clear. The temperature of the air was generally about +34°, and that of the water 33°, having increased a degree or two since we entered this water, which was comparatively free from ice. One boat was towing ahead, until a light breeze enabled us to advance without its assistance.

The "Lady Franklin" was about a mile in the advance of the "Sophia," when a boat was observed lowering into the water, and pulling off in the direction of Cape York, or of a sheet of ice in a small

bay, to the eastward of it. It soon returned, bringing off three Esquimaux, poor wretched creatures, whose parents, I suppose, Sir John Ross had designated the Arctic Highlanders, probably, because with a true Highland spirit, he thought them as much superior to their relations in a more southern latitude, as the Highlanders are to the Lowlanders everywhere except in Scotland. They made a fearful attack upon some narwhal's skin, which we had boiled with the intention of having it pickled. It appears to be a great luxury as well as a rarity to them. Mr. Petersen conversed with them in their native tongue with the greatest ease; but the excitement and ecstasy they were in prevented a satisfactory conversation. All his interrogations about the missing ships appeared to them to be quite meaningless, as they had often seen English ships and white men. Mr. Stewart recognised one, whom he had seen and spoken to on board the "Joseph Green" whaler, off Cape York, during the previous season. Presents of useful articles, such as needles, knives, empty meat canisters, pieces of useless wood, such as old broom handles, and iron hoops, were made to them, and then they were sent ashore in the boat. They certainly were the most wretched creatures that I had ever seen, worse, infinitely so, than the Hottentot, who inhabits the sterile coast of Africa, from the

Orange River northward, where hardly anything but arid sand is to be seen; and who subsists almost entirely upon the shell fish which he finds among the rocks. Mr. Petersen expressed great sympathy for them; and when he told a female, whom he saw on the first visit the boat made to the ice, that his wife was partly of her kindred, her delight seemed to know no bounds. She often pointed to her child, which was on her back, in the hood of her greasy and dirty coat, and told him that it was a girl.

The evening was nearly calm, and the sky was remarkably clear; objects could be distinguished very distinctly at great distances. The ships generally had steering way, and with the assistance of sometimes one, and sometimes all the boats towing a-head, we creeped away to the N. W., with grateful emotions that we had got clear of Melville Bay.

August 13*th.* — One boat was towing all night and morning; the wind was northerly, and it was hourly increasing, although, at first, there was but a very gentle breeze. The boat was hoisted up, and "tack" after "tack" from the pack to the land, soon brought us to the west and north of Cape York.

At six o'clock in the morning Captain Austin's squadron was observed coming up the Strait, and the two small schooner-like ships appeared to be in tow astern of the large ships. The pack was close

in with the land at Conical Island, off Cape Dudley Diggs, and the wind, although highly favourable for working among the ice, was too much down the Strait to clear it off from the land. A large space of water extended to the westward, on a parallel of latitude a few miles north of Cape York. Mr. Penny, thinking it might suit his purpose in pushing to the westward, stood off in that direction; but the attempt was unsuccessful. The ice became closer and closer, until it was found to be one solid pack. The fragments of which it consisted had small interspaces of water, which were covered over with a formation of young ice, of sufficient strength to cement the whole together, and prevent separation under the ordinary influence of the tide.

After we had proceeded as far to the westward as the ice would permit, we at once came to the conclusion, that no good could be done at so great a distance from the land. But when we turned round to proceed to the eastward, it was discovered that the drifting streams had come down before the wind, and hemmed us in, so that capstan and winch were both necessary before we got clear of it.

August 14*th.*—Early in the morning we were close in with the land between Cape York and Cape Dudley Diggs. There was ice in straggling patches over the surface of the water at a distance of five or six

miles from the land; but close to the land there was very little ice, except further north, where it seemed to approach, if not close in with it altogether. There were a great many icebergs, but none of them were very large, and they had flat tops, as if the glaciers which produced them had been but small. Many of them, of very limited dimensions, presented all the features of icebergs that had altered very little since they had come from the glaciers. There was no ice attached to the land; the little rippling waves seemed to play cheerfully upon the beach, and little auks could be seen swimming in graceful little bands in all directions. Several glaciers enter the sea between Cape York and Cape Dudley Diggs, but they are very small. The valleys which they fill vary in breadth from about a quarter to half a mile. The free edge of the glacier did not appear to be above thirty to forty feet above the surface of the water—a height which corresponds with that of many of the icebergs already noticed in the neighbourhood of this coast. They did not appear to ascend very far inland; indeed, my impression was that each valley had its own distinct glacier. I received these impressions from the altered character of the land. Instead of a wretchedly bleak and desolate-like coast, with only an occasional escarpment of the black land, which

appears as a sort of exception to the universal whiteness of the whole surface, as it really is in Melville Bay, here these small glaciers seemed to be almost the only exception to the highly genial although black appearance, which the whole coast presented to a considerable distance inland.

The surface of the glaciers was of a dirty colour, but there were no moraines. It appeared to be owing to fine dust and sand blown from the adjacent land, or carried by small rills of water from the sides of the valley. Where there were patches of snow on the land, a close examination would discover more than the dirty colour, which was also present,—a tinge of dirty red, which, in suitable localities, applied also to the glaciers. This is owing to a minute plant which has excited great interest, and has been most carefully described by many distinguished botanists, under the popular name of red snow (*Protococcus nivalis*). From what Mr. Petersen told me, after he had visited the famous localities where it is said to extend to a depth of twelve feet, and also from the replies of the natives to questions upon the same subject, there appears to be no reason for any other opinion than this, that it is a foreign body among snow or ice, which it can only find access to by being carried, either by the water of the pools in which it grows after they

begin to overflow by influx of water from snow melting at higher elevations, or by the wind after the water has left it dry upon the rock. There does not appear to be any objection to the idea that this plant may grow upon stones and sand on the surface of a glacier, provided that there be water covering them;—nor to the supposition that a part of an increasing glacier may become impregnated with it, by being carried from some neighbouring locality by the wind. Although the red snow appears as red as blood when viewed with a high magnifying power, among the snow, along with probably abundance of other adventitious substances, it fails to exhibit its real colour, and rarely does more than impart a dirty appearance. It would prove highly interesting to examine whether the circumstances under which it is developed in the Alps and in the Arctic Regions are the same.*

The weather was very mild during the whole day, as the ships lay motionless on the mirror-like surface of the water, and boats pulled about in all directions. The sky was very clear, and there was hardly a breath of wind. The temperature of the water was generally 34°, and that of the air from +37° to +30°. We could distinguish objects at the remotest distances all round. Everything was

* Agassiz, Etudes, chap. v. Travels in the Alps, by Professor Forbes, chap. ii.

present which nature could get up, in such a high latitude, to make the day pleasant to us.

An investigation was going on with respect to a report, that took its origin in some conversation which happened between an Esquimaux on board the "Felix," whom Sir J. Ross had taken from Holsteinberg, and some of the natives we had on board but two days previously. The report conveyed this meaning; "that two ships had been destroyed by fire in Wolstenholme Sound, and their crews massacred by the Esquimaux." It seemed to have taken a deep hold of not a few of the officers in three of the four expeditions which had come together, it must be acknowledged, by mere chance. It was a favourable omen, that chance had collected the whole force of the searching squadron, to deliberate over an Esquimaux report which threatened to seal the fate of Sir J. Franklin and his companions, and send us all back to England without advancing any further. The Esquimaux (if I mistake not, five altogether) were examined on the land and on board ship, alone, and together, at the huts and elsewhere, but nothing could be elicited that might lead to a corroboration of the above report; and the inventor of it was stigmatised with the odious appellation of "liar" by the natives of Cape York. Sir J. Ross, Captains Austin and Ommanney, Commanders Forsyth and

Phillips, Lieut. Cator, Mr. Penny, and Mr. Petersen, were all engaged in the investigation. It was discovered, that a ship had wintered in Wolstenholme Sound, and that some of the crew had died; and it was also discovered, that there had been a great mortality among the natives from famine. It was conjectured at once that the ship alluded to was the "North Star," for no whalers had been detained among the ice in the previous autumn. Understanding the language of the Esquimaux, and being conversant with their manners and customs from fifteen years' constant experience, Mr. Petersen was qualified, above all others, for the valuable service which he so ably rendered to the whole searching squadron. Having accompanied Captain Ommanney and Mr. Penny in the "Intrepid" steamer, he described the landing of a boat party at Cape York. There were but five poor wretches, with no other weapons than stones, whom they had to meet, yet they were under cover of a file of marines! How the destruction of two ships by fire, and the massacre of their crews, — one hundred and thirty-eight well-armed men, — could have been attributed to a handful of wretched creatures, who possess literally nothing but their half-naked bodies, is so preposterous and so repulsive to common sense, that one cannot help smiling, in spite of the painful

feeling which is aroused by allusion to such an atrocious deed.

Captain Ommanney took an Esquimaux on board the "Assistance," whom he found willing to accompany the Expedition. Considering the general reluctance of the Esquimaux to abandon their homes, it was difficult to conceive what his inducements were to leave his youthful associations, and everything that could be dear to an Esquimaux, except he had been influenced by the fear of partaking of the horrible fate of many of his tribe,—death by starvation. His name under the red pendant was Erasmus York, by which, I believe, Captain Austin designated him when he first saw him.

The natives at Cape York, and along the coast to the northward, are very wretched. Mr. Petersen says, that they have no better means of transportation over the water, when the ice fails them, than some peculiar arrangement of inflated seal-skins, upon which one or two of them can sit and paddle along. They are often reduced to great straits, and frequently have to attack deer with stones thrown out of their hands. In this way they sometimes succeed in wounding one; after which they rush upon it and overpower it by their numbers. But they are most successful in destroying life in this rude way among the rotges, which are very

abundant in their neighbourhood during two or three months of summer. They sometimes have recourse to the "sling," which they find useful in attacking animals on the land. In the use of this instrument, the Esquimaux of the present day may be associated with the inhabitants of a warmer climate three thousand years ago. Mr. Petersen advised them to migrate to the southward, where they would be much more comfortable; but they expressed great doubts that they would not be able to accomplish so great a distance as two hundred miles along the coast of Melville Bay, which he described to them as being wretchedly barren, and affording hardly any resources whatever to persons making a journey over it. I fear the Esquimaux will have to relinquish the possession he holds of the Arctic Highlands, and betake himself to a more genial climate in the south. Perhaps he may be reluctant to do so, from the attachment which he naturally has for the north, whence he is taught to believe his ancestors, the true Innuit, have all sprung.*

After being engaged in the investigation since

* The word Innuit appears to be used among the Esquimaux to express the purest variety of the human race; those who do not belong to it being considered mere deteriorations; and in this respect it seems to convey the same idea as Beni Ismail does among the Arabs.

an early hour in the morning, Mr. Penny and Mr. Petersen returned on board the "Lady Franklin" in the evening, doubtless well pleased with themselves for being the chief agents in proving the falsity of the report of Sir John Ross's Esquimaux. Captain Austin's arrangement was a little altered; that alteration being, that the "Assistance" was first to proceed to Wolstenholme Sound, and from thence she was to resume the course that had been fully settled before we left Melville Bay.

The evening was quite calm, and the sea was as smooth as oil. On the one hand was the loose pack, on the other the land, as we lay motionless when the steamers began to get ready. The clouds of black smoke which issued from their funnels hovered overhead for a short time, and then began to settle on the already dirty enough (not crimson) snow of the Beverly cliffs, as if there seemed to be a desire to blot out the last traces of their beautiful colour, that had been fading ever since the memorable voyage of '18.

The two large ships fell in astern of the steamers and picked up their tow-lines, and after them again the "Felix" and the "Albert;" and in the deafening cheers which passed between us and them, for we were not taken in tow, could be distinguished, as they were re-echoed from the neighbouring rocks and

icebergs, our hearty wishes of "God speed" in your noble work of philanthropy. In a few hours we lost sight of them in spite of the smoky train with which they variegated the clear and almost perfectly cloudless sky, in the direction they had taken. All hands were called and the boats were sent ahead to tow, until the ships should gain a safe offing, for we were too near the land, or until a wind should arise with which we could make some progress.

August 17th.—Three days of calm and foggy weather, in which we made hardly any progress, passed by very lazily indeed. All hands were frequently towing, but to endure this for days together was too much for human flesh and sinew; hence the watches had to be set, and, instead of sending a boat ahead to tow, two boats, one on each side, were lowered in the tackles from the davits, until their keels were within a few inches of the water, where they were secured, so as not to swing about, and in each of them four oars were plied to such advantage that we could advance about a mile in the hour. This is called "centipeding" by the whalers, from the resemblance the appearance of the ship, with ten oars on each side, has to a centipede. But as we could not count quite so many oars as the whalers used, our ships more resembled spiders than centipedes; and I hope they were

found following their example for diligence and perseverance.

We were frequently annoyed and hindered by young ice, which always met us when the pack of loose ice was approached. The temperature of the water was +30° or +31° at the ice; but nearer the land, where it seemed to be much more shallow, it was considerably higher. We had another proof of the fact, that where the ice is permitted to move along with the water, there it maintains its thickness, and prevents the access of the sun's rays to the water; and hence the presence of the young ice around and among the fragments of the loose and drifting pack. Narwhals were very numerous, and their blasts frequently arrested our attention during the monotony of the calm. A piece of the flesh of one of those animals was picked up out of the water. There were portions of the skin, oily tissue, and flesh or muscular fibre. At first it was very doubtful what could have been the cause of this, for it seemed to have been hacked a little, as if a coarse instrument had been used in cutting it. But Mr. Petersen concluded that the animal must have died, either from natural causes, or from being wounded by ball from our rifles, and had subsequently become the prey of sharks, which are very numerous in those seas. Rotges were also very abundant, and something

was observed, peculiar to them, at this time, which, so far as I know, has been hitherto unknown. The head and upper part of the gullet, or floor of the mouth, appeared to be very much enlarged; indeed, quite out of proportion for so small a bird. As the breeding season advances, the skin and thin muscular layer beneath and on both sides of the tongue are distended into something in the form of a pouch, which will be found crammed full of their ordinary food (*Gammarus Arcticus*, and other allied crustacea, in which the sea abounds), which they bear off to their young. I have chased them with a boat, frightened and shot them, without succeeding in making them disgorge the precious contents of these wonderfully capacious pouches. Has this any resemblance to the enlargement in a similar part of the mouth of the pelican?

Pteropod molluscs, the *Clio Borealis*, and *Clio helicina* could be seen swimming gracefully in the water. The motions of their little appendages were plainly distinguishable out of the boat alongside. They were very easily caught, compared with the beautiful and active little "Cetochilus," which darted with the swiftness of an arrow out of reach of its pursuers.

When there was fog, it sometimes cleared up at noon or in the evening; and then the distortion of distant objects by refraction was very great. The

division of Captain Austin's squadron which entered Wolstenholme Sound, was seen coming out of it, and proceeding to the westward by the assistance of steam alone. The small ship appeared to be always in tow.

In the evening a light breeze sprung up, which gave the ships steering way. It was from a little to the eastward of north, and was accompanied by a thick fog towards midnight. Our course lay through ice, which would have been very easily managed, had it not been for the young ice, which had increased to nearly a thickness of one inch. The capstans and warps wrought by "all hands" were necessary; but we got through, and stood to the westward, across the top of Baffin's Bay, with the wind from about E. S. E.

August 18*th.*—At four o'clock in the morning the fog cleared away, and the beautiful clear sky opened out; the wind also veered a little to the southward, and increased considerably: our studding-sails were set, and, as our neat little ships scudded before the increasing breeze, there was nothing to cast the slightest gloom upon our bright prospects of being soon in the spot where our services would be called into requisition.

Wolstenholme Island, and the black land from Cape York northwards, was sinking rapidly astern,

while the Cary Islands were opening out on the starboard beam, and the loom of the land on the west side of the Strait was beginning to be distinguished ahead.

The "Sophia" was found to overhaul the "Lady Franklin," and even pass by her. This was believed to be owing to the latter being out of trim; but if it was, all the trimming that could be made about the deck, by changing the position of guns and other weights, completely failed to make any improvement; consequently, the "Sophia" had, for once during the voyage, to shorten sail, to wait for the "Lady Franklin."

Our course lay along the northern extremity of the "middle ice," which appeared to extend to latitude 76° 24′. It was composed of very large masses, some of which were drawing twenty to thirty feet of water, and had long projecting tongues, extending fifteen to twenty feet all round that part which appeared above water. Immediately at the water-line, the ice was decayed to a depth of six or seven feet into the side of each floating mass, which gave it the appearance of a rough resemblance to an hour-glass, with the exception of the disproportion of height and breadth, and also of the parts above and beneath the water, at the surface of which the line of contraction always occurred. The deficiency of the ice here was un-

doubtedly owing to the dissolving action of the water being greater at the surface than at any other part below it, and also greater than that of the air or of the direct rays of the sun upon that part which was above water.

The enormous thickness of the ice, in the middle of the Strait, like that of the ice in the Greenland seas, although in a less degree, compared with the thickness of the ice attached to the land, which rarely exceeds six or eight feet below latitude 76°, appears to be owing to the facility with which it moves along with the water, without the water being carried past it, as always happens in the case of the land ice. It is clear that there is a southerly-going current, and that it is on the surface, where it includes the ice and extends to various depths, according to the locality, and the season of the year. On the eastern side of the Greenland Sea, and also on the same side of Davis Straits, it cannot be perceptible at the surface, where the northerly-going current has been observed; except, perhaps, when the latter current is diminished in extent by the intense cold during winter.

Were the southerly-going currents in the Polar seas to be extended from shore to shore, and from the surface to the bottom of the ocean, in the course of, speaking comparatively, a few, perhaps even one

thousand, years, the water would be reduced to a mere trace of salinity, owing to the influx being supplied entirely from the atmosphere in the form of snow and rain, and also in the form of icebergs, which have a purely atmospheric origin. The only process by which the mean salinity can be kept up, under such circumstances, is a counter current, which in some cases, will be at a considerable depth beneath the surface of the water, and in other cases, at one of the sides of the straits or seas; both of which, there is no doubt, are at work in the Arctic Circle.

The first particle of "middle ice" is the minute film of young ice which forms on the surface of the water, at some of the fixed points in the top of Baffin's Bay, whence it begins to move imperceptibly southward along with the surface water, on which it feeds: exposed during the greatest part of the year to a mean temperature below that at which sea-water begins to congeal, it hourly increases in dimensions, until some of it is twenty feet thick, and perhaps much more; it stores up the drifting snow during the endless nights of winter, and the flaky snow during summer, spring, and autumn, also affording reservoirs for accidental showers; and it protects its parent, the sea, on which it is irresistibly borne along, equally from the powerful influence of the sun and the all-subduing frost, until it merges into a warmer climate, and

ultimately yields itself into the bosom of the Atlantic. Icebergs frequently take up their position in the "middle ice," and drift along with it, often causing great commotions among the largest floes which may be carried against their rugged sides. But by far the greatest number of icebergs are to be seen along the eastern border of it, although generally speaking they tumble and roll about in all parts of the Strait, without any regard whatever to the surface ice.

The space of open water which always occurs in the top of Baffin's Bay, as the result of this constant drift to the southward, must vary in extent with the period of the year. During winter it becomes diminished very considerably, owing to the extension of the ice attached to the land, so far as it is known, all round. During summer, again, this ice extending from the land, breaks up to a greater or less extent, and the formation of young ice is interrupted for a time: the entire mass of the "middle ice" continues to move southward, leaving an extensive basin of open water behind it, which, in its turn, affects very materially the temperature; and thus, by facilitating the thaw of snow upon the land, the latter assumes a black appearance all round it: it also provokes southerly winds, which begin to prevail towards the middle of June, and before the end of July they drift large quantities of loose ice into it, from the "middle ice" and also from

Melville Bay, by way of retaliation. During winter, northerly winds prevail, and the ice when loose is carried southward: during summer, southerly winds prevail more or less, and the ice is carried hither and thither with great velocity, to the great annoyance of the adventurous voyager; and the influx of water into those ice-bound regions, from more southern latitudes, is also greatly increased. It is truly wonderful how the balance is kept up within the Polar Circle,—how the sea does not become fresh-water, and the land does not become overgrown with the glacier accumulation. By alternating heat and cold, every natural process seems to be guided; remove this, and everything in nature stands still; when vitality is concerned, light, the light of the sun, is superadded: let both be removed, and Chaos will resume its gloomy reign. The density of sea-water diminishes on the application of cold, after it has been cooled to $+39°$; consequently, it rises to the surface by exposure to still lower degrees of cold; and its supernatant properties, which commenced a little below $+39°$, are rendered powerful in a tenfold degree by perfect congelation at $+30°$, or $+32°$, and a great proportion of its saline ingredients are precipitated. The air, on the contrary, soaring aloft, and bearing vapour from another climate, becomes increased in density by the application of cold, and lowers gradually to the surface of the earth, where it

contributes to the increasing glacier, what it may have borne from the sunny regions of the South, and then joins in a happy union with the surface water and the ice, in seeking southward charged with cold, which makes it and them welcome visitors in the temperate and torrid zones.

The increase in the temperature of the water, which caused the decay of a part of the thick ice, was facilitated in its action upon it, by the constant agitation which was kept up at the edge of the "middle ice" in such a large sheet of water. The sound of the dashing waves, when they were opposed by the excavated margin of that part which was above water, was heard at great distances. It resembled the distant roaring of the sea during a storm; and a still closer approach reminded us forcibly, although in miniature, of the deafening sounds of the waves of the German Ocean, — when they could be seen from a neighbouring cliff, following one another in rapid succession into the deep and almost bottomless caves and excavations in a rocky coast.

In dark nights, in the month of October, off the west coast of Davis Strait, in latitude 65°, after his voyage in the Arctic seas is almost completed, and he must proceed to his native shores, whether successful or unsuccessful, the intrepid whaler is often very thankful for this sound; because, by its assistance,

he is able to avoid one of the greatest dangers to which his arduous and adventurous duty exposes him. By the time, however, that the ice has reached beyond 62° to 65°, it does not generally present such long tongues as one often sees in the northern part of the Strait.

CHAP. IX.

PASSAGE FROM BAFFIN'S BAY TO WELLINGTON CHANNEL.

Arrival at the West Side.—Jones Sound.—Unfavourable Weather.—State of the Ice.—Thick Weather.—American Ships seen.—Jones Sound full of Ice.—Narrow Escape.—Violent Gale.—Heavy Sea in Lancaster Sound.—Ships hove to.—Admiralty Inlet.—The "North Star."—Proceedings of the "North Star."—State of the Ice in Barrow Straits from Mr. Saunders' Report.—Admiralty Orders to Mr. Saunders.—Mr. Saunders' Intentions.—Crew of the "North Star."—Parting with the "North Star."—Plying westward.—A Hypochondriac.—Appearance of the Coast.—Barrow Straits.—Leopold Island.—Appearance of the Ice seen.—Land free from Snow.—Three Ships seen.

August 18th.—At four o'clock in the evening, as the Cary Islands were sinking rapidly in the eastern horizon, the west side of Baffin's Bay on the north side of Jones Sound was seen, and for this part our course was shaped, with the view of exploring it, if practicable, and of passing through it into the Wellington Channel. There were loons and little auks in the water, although they were not quite so abundant as we had often observed them previously; the rotges, especially, were getting much thinner as we advanced to the westward, and, in the course of the evening, they were lost sight of altogether. They

had their young in the water, and could be seen feeding them out of their capacious pouches, uttering a peculiar cry, which I had never heard before, and which seemed to express an affectionate feeling.

The distance between the Cary Islands and the north boundary of Jones Sound, Clarence Head, is not more, if it is quite so much as seventy miles. Since noon, when we were in the longitude of these islands, and about eight or ten miles south of them, we advanced in the direction of Cape Clarence, at the rate of at least six knots. At nine o'clock, we must have been within about sixteen miles of the land opposite the entrance into Jones Sound. An extensive body of ice filled it from the side, and extended both north and south along the coast, especially the former, where it seemed to terminate in a clear ice-blink, which gave no hope of effecting an entrance into the Sound by that route. The studding-sails were taken in, and the ships were hauled nearly close to the wind, so as to lay clear of the pack as they proceeded along its edge, expecting an opening to lead westward into the Sound. It was close throughout its entire extent, as far as could be judged from the crow's nest, and it also appeared to be very heavy, and to contain icebergs in abundance. The wind was hourly freshening up, or at least seemed to be doing so, from the threatening appearance of the

atmosphere in a S. and S. E. direction. The barometer had been rising steadily for two or three days, and now it was 30·16, far above its mean height. The temperature of the air was +33°, a little below its usual indication, owing to the wind blowing obliquely across a large tract of ice. The temperature of the water was 35°, which led to an idea that there had been a great space of open water for some time.

The indications of the atmosphere were by no means encouraging; indeed, they were as surly and ominous as we had witnessed since we came within the Arctic Circle. We might feel almost certain it would not be a westerly storm, from the high state of the barometer, but still it might come from some point to the eastward of S.; it was promising fair to land in that quarter, as it had been veering round since the morning, and the angry and threatening clouds were piling up from the horizon to an altitude of forty or fifty degrees. A little before midnight, we came to a point of the pack which was the commencement of a slight western trend, and this enabled us to keep the ships a little more before the wind, for they had to be hauled rather close before rounding the lee pack. The weather became so thick, that objects could not be discerned at even a short distance; however, we managed to

keep within sight of the lee ice, but the ships made very little progress, as there was a slight swell, or short sea, which checked them when they had not the wind free.

August 19th.—The weather still continued foggy; but, as the morning advanced, it began to be a little cloudy, and this we preferred, because we could distinguish distant objects. At three o'clock in the morning two small ships were observed, and in a few hours the American flag was recognised. They proved to be the schooners "Advance" and "Rescue," under the command of Commander De Haven, which had been sent out from New York in search of Sir John Franklin.

Towards noon we saw the land on the south side of Jones Sound. The pack we came to last night was again observed entering into the Sound, and an extensive range of icebergs was seen along the pack ice closing in with the land, and following it southward from Cape Caledonia. We approached still closer, and saw the pack studded with small icebergs, filling up the entire entrance of the Sound from Cape Clarence to Cape Leopold. The wind began to increase very rapidly at noon, and it was still blowing right into Jones Sound. The sky was overcast with dense blue and portentous clouds. The temperature of the air was $+37°$ at noon, and of the water 35°. The

barometer had risen to 30·23, which, with the other indications, left little doubt in our minds that we were to have an easterly storm.

The close state of the ice in Jones Sound, coupled with the advanced period of the season, was more than a sufficient reason for abandoning the idea of proceeding through it into the Wellington Channel. Accordingly, a course was shaped for Lancaster Sound. Perhaps we might have got into the entrance of Jones Sound by boring and heaving together; but this was very problematical, and it could only have been at the risk of continuing beset for some time. If a ship is beset early in the season, and a thick coating of young ice cements the whole pack into one entire sheet, release may be looked for as the season advances; but, if she is beset late in the season, her chances of getting clear will depend upon distant casualties, and ten to one if she does not drift about, at the mercy of wind, tide, and current, until she is within the influence of the southerly drift, which mercilessly holds her in its powerful grasp until she is set free in the Atlantic. The whalers have too often experienced the ill effects of getting beset late in the season, not to avoid it with the utmost care. The "Dee" of Aberdeen, in 1836, and the "Swan" of Hull, 1837, afford painful instances of this: and so also do the difficulties which

a large portion of the whaling fleet experienced among the drifting ice, in some subsequent year, when some of their ships were partially abandoned, from the fear that they should not get clear of the pack that season; a favourable change, however, invited them to return, and ultimately they got clear, without being detained for the winter. If I mistake not, one of those ships was the "Monarch," of Dundee or Kirkaldy. Besides the inevitable risks of getting closely beset among such a large body of ice, we also had great doubts about the distance to which the Sound might proceed to the westward. From the fact that it was completely blocked up with ice in its entrance, after the wind had been blowing twenty-four hours from the eastward, we could safely infer that it had a bottom, and that the ice had accumulated in it in consequence of not having a free drift before the wind.

As we proceeded southward, we were within about ten miles of the land, our distance varying occasionally from the irregularity of the coast. Cape Leopold, Princess Charlotte Monument, Coburg Bay, and Cape Horsburgh were successively passed. There was rather a heavy sea, and it was increasing as the entrance of Lancaster Sound was approached.

In the evening the "Lady Franklin" carried away one of her royal masts. She was but a short distance ahead of the "Sophia" at the time of the accident; and, as she had to haul her wind a little to

clear the entangled ropes and royal rigging, the latter approached rather near her, and found it necessary to pass close by a small iceberg, on which the sea was breaking furiously, and sending small showers of spray into the air with a surging noise. The ice appeared to be at a great distance from the land, there being at least forty miles of water eastward of Cape Horsburgh. The land here had a less genial appearance than the land northward of Cape York, on the opposite side of the Bay; but it was seen under less favourable circumstances: for, when we were at Cape York, the weather was generally clear; but since we sighted this side it was overcast and gloomy, and this not only threw a shade upon the land, but also upon the buoyant temperaments in our Expedition.

At nine o'clock in the evening we lost sight of the two American ships astern. They were carrying a press of sail, but the increasing gale forced both them and us to shorten sail, and before midnight we were under close reefed topsails, running at the rate of seven or eight knots.

The sea was beginning to run high and cross: everything on board soon found its level from the tossing of the ships; upon the whole, however, they behaved very well, although frequently a good deal of water came on board whenever the course had to be altered

for an iceberg which perchance lay in our way. The rudder of the "Sophia," which formerly made a great deal of noise and agitation at the stern-post in a sea-way, was found to have undergone a great improvement in the hands of the carpenter, who, early in the season, had got orders to increase its size by clamping and bolting pieces of wood on it, after a manner described by the commander.

August 20th.—I was called out at five o'clock in the morning, to see a man who had fallen on something, and was reported to have contused his thigh. He thought it was broken, and so did his messmates: but there was scarcely any injury; so little indeed, that he was at his duty almost as soon as if nothing had happened. I mention this because it is the first time that anything in the shape of an accident occurred.

The sea was running high at this time, and the sky was densely overcast with a thick misty haze; there was heavy rain occasionally, and the wind was blowing with terrific violence right up Lancaster Sound. The ice was seen on the south shore to the westward of Cape Hay, where the water was of a white tinge, which made it appear in very striking contrast with that of the middle of the Sound, or of Baffin's Bay. It is probably owing to two causes,—shallowing, and some difference in the character of the bottom: I should suppose chiefly the latter. The

watch was busily employed taking in the boats, by no means an easy duty in such a storm; however, it was accomplished without the loss of so much as an oar.

In the afternoon it was necessary to heave to off Admiralty Inlet. The sea was running very high and cross, and the sky was overcast with dense clouds of a threatening appearance. A temporary lull at noon gave way to a gale of almost terrific violence towards night, accompanied by a good deal of rain. The land on both sides of Admiralty Inlet is high and bold, and the water seems to deepen rapidly at the foot of it. The wind drew a little into it; so that we found it impossible to get clear of its western headland, from the leeway the ships made, when as much sail was set as was necessary to give them forward motion, when they were hauled close to the wind. It is a feature peculiar to all inlets in Davis Straits and the adjoining seas, that the wind blows parallel with their sides, and hardly ever across. This is many times exemplified in the Waygat Strait between Disco Island and the Bunke Land, and in Lancaster Sound.

August 21*st.* — The wind moderated towards morning, and the gale appeared to have spent itself. It had lasted during the greater part of three days, in which time the barometer had descended from 30·23 to 29·70, upwards of half an inch. The barometer

began to ascend soon after six o'clock, the wind having moderated at least three hours previously, and at noon it was up one-twentieth of an inch. It did exactly the same thing yesterday, but fell with the increase of the wind soon after mid-day. We could hardly trust to its indications in the present instance. The sky, however, appeared to promise better weather, although it was still overcast.

Having made sail we stood across the Sound, and at noon we observed a ship right ahead, which in a few hours was discovered to be H. M. S. "North Star," commanded by Mr. Saunders. She had wintered in Wolstenholme Sound, having entered it on the 26th September, after drifting in the pack in Melville Bay, and also in Baffin's Bay, for nearly two months. The report of the Esquimaux at Cape York, that had been brought to light in the investigation about the massacred crews of two ships, was fully verified by the information which Mr. Saunders gave us, particularly with respect to the loss of several of his crew; but to him and to his officers, the destruction of two ships by fire, and the massacre of their crews, appeared altogether fabulous, as they had heard nothing of it, nor seen anything, in their long intercourse with the natives, that would lead to such opinions.

We learned from Mr. Saunders, and the officers of the "North Star," that, having got beset on the

30th of July, in latitude 74½° or 75°, in Melville Bay, they drifted about for two months in every direction, but chiefly northward, after which they got into their winter quarters in latitude 76° 33′ and longitude 68° 56′, on the 30th of September, where they remained until the 3rd of August, when they got clear, and proceeded westward. Having met with ice in the top of Baffin's Bay, southward of the Cary Islands, they did not reach the western shore till the 8th, when a boat was sent into Possession Bay, where nothing but "orders" relative to Sir James Ross's Expedition had been found. Thence they proceeded up Sir James Lancaster's Sound, and reached Whaler Point on the 12th. Port Leopold was examined, and the stores left by Sir James Ross were found to be as he had left them the previous season. They attempted to land provisions at Port Leopold, Port Bowen, and Port Neill, but the unfavourable state of the ice presented an obstacle everywhere which they could not overcome.

Mr. Saunders informed us that the ice in Barrow's Strait presented one continuous sheet from Cape Clarence to Cape Fellfoot, or Maxwell Bay, which he feared would prevent the ships advancing, this season, as far as the entrance of the Wellington Channel. He expressed great astonishment when he discovered that ten ships were engaged in the search

for Sir J. Franklin in Baffin's Bay and Lancaster Sound, besides the "North Star," and also besides extensive expeditions in Behring's Straits. On receiving his Admiralty papers, he was no less astonished to find that their Lordships' orders to him were to land his provisions on Disco Island. Mr. Penny suggested to him to land them at Navy Board Inlet, or Admiralty Inlet, where he said they would be quite safe, and in an advanced position for the use of any of the ten ships that were to winter. They might not require them the first or second winter; but, in the event of having to remain a third winter, they would be called into requisition: and, moreover, the knowledge that such a quantity of provisions was stored up in such a convenient locality would carry the advancing expeditions on in a fearless manner, knowing that their return would be safe, even suppose the ships themselves were crushed among the ice, if they could but save their boats. Mr. Saunders seemed to dread disobeying his orders, which were so distinct; and on this head he examined Mr. Petersen, our interpreter, who had spent several years at the settlement on Disco, with respect to store-houses and places of safety from the Esquimaux. Mr. Petersen informed him that he might rest assured he would not find any accommodation on the coast of Greenland in

the way of store-room; and, if he landed his provisions on the land itself without the convenience of a store-house, they would not be safe from the natives, and the Governor would be under the necessity of immediately destroying spirituous liquors, to prevent intoxication among them, if his remonstrances against the landing should not be heard. Mr. Penny also, to dissuade him from that course, said, that the orders which he had just received were intended only on the supposition that the "North Star" would be found on the Greenland side of the Strait; and, to convince him, that it was his opinion that no bad results, or their Lordships' displeasure, could follow the plan which he proposed, he offered to take the whole responsibility upon himself. Mr. Saunders would not acknowledge Mr. Penny's responsibility; had the latter, however, belonged to the Royal Navy, Mr. Saunders must have attended to his directions and advice, at least I suppose so, whether he was his equal or junior. In the absence of Captain Austin, he knew not how to act. He said, that it would be better to take the provisions to England than to land them on Disco Island: but, for all that, if he acted according to the tenor of his orders, it was impossible he could do wrong; and, with these impressions, he parted company with Mr. Penny. Although it would have been of signal service

to our expedition to have known the steps Mr. Saunders would take, that was denied to us even in the remotest shades; we expected, however, if he should deem proper to call at either of the two places already mentioned, Admiralty or Navy Board Inlet, and to act after Mr. Penny's suggestion, that, as Captain Austin had undertaken to examine the south shore of the Sound, he would fall in with the "North Star," and order the provisions to be landed in the place which might appear best in his judgment, as the senior officer engaged in those seas.

August 22nd.—At one or two o'clock in the morning, a breeze sprung up, which gave the ships steering way. The "North Star" appeared to be shaping a course for Cape Hay or Possession Bay, on the south side of Lancaster Sound. We were within a few miles of the land on the north shore, in the evening; and, as there was a light breeze from the N. W., we plied up close along it; and on every alternate tack the ships were put about so near the land, that any arrangement of even a few stones on the beach, which might deviate from what nature had established universally, could be detected.

The crew of the "North Star" looked rather pale, and some of them appeared to be emaciated. The Arctic winter had taken effect upon them, and had told its tale upon their constitutions. They were

one hundred and sixteen days without the sun. The minimum temperature was $-63\frac{1}{2}°$; it occurred on the 24th of February, and is one of the lowest degrees of natural cold ever observed. They seemed to have no objections to their orders to return to England. One of the crew of the "Lady Franklin," and among the best men on board, gave way to the frailties of his nature, and came forward to his surgeon, saying that, as he was not in a proper state of health to accompany the Expedition, he begged a passage home should be obtained for him in the "North Star." A survey was held, and he was pronounced as sound as any man in our Expedition, upon which he appeared satisfied; probably he would have been more pleased had he been pronounced unfit, for he appeared to have a cast of the hypochondriac about him, which at first sight was not detected. With proper care, there was no reason why he should not continue one of the best men in the crew of the ship to which he belonged.

The latitude was 74° 27′, and the longitude 86° 27′. The temperature of the water at the surface was 34°, and that of the air +36°. Few or no living creatures of any kind were seen; at one time a whale was reported to be close astern, but only one or two persons saw it, and, when they were asked if it was the "proper" whale, they said it was only the eddy they had seen.

August 23rd.—During the early part of the day there was a dense fog, which began to disappear at three A. M., and at noon cleared entirely away before a smart westerly breeze, with which we plied up the Strait. We kept close along the north shore, and every time the ships were put about at the land they were again so near that a stone could almost be thrown out of the hand to it. This is an exaggeration, but it is used merely to show that we were within a short distance.

The coast here presents a feature which, if once seen, will not readily be forgotten. It is generally bold, although some very long spites, or low jutting-out points, occur, of which Cape Fellfoot is a good example. Here a whole line of even coast rises out of the water, with a talus or heap of disintegrated rock, to a height of two hundred feet, and is surmounted by perhaps as many as half-a-dozen endless and perfectly horizontal rows of buttresses, which, for regularity of form and distance apart, will vie with the most uniform arrangement of large dormar-windows in the finest streets of our metropolitan cities; there a splendid deep bay occurs, on one of the sides of which rise, in a compact mass, impregnable fortifications, which are marked by parallel horizontal lines, and are arranged with the same precision as if the level, the square, and the plumb-line had been used when they were reared. Strong and bold as this coast may appear to be, and

bidding defiance to assault in all directions, time, with its invisible agent, heat alternating with cold, assisted only by water, saps its foundations, and runs mines into its lofty citadels; and the result of this action is an increasing heap of rubbish, upon which the same agents are still exerting their irresistible power, reducing to splinters and small fragments, and ultimately to a fine powder liable to be washed or blown into the sea, what had been set free in masses of more than a ton weight. The face of one of these bluffs, if examined closely, will be found composed of the solid rock in horizontally stratified layers, except at the base, where there is generally a heap of rubbish, which has been accumulating as the result of the disintegrating process at a higher elevation. Here each buttress is planted closely by its neighbour: its base is broad, while the apex or top is brought to a point; the retiring sides meet those of the adjoining buttresses, and the point of junction is the bed of a miniature mountain torrent, the produce of the dissolving snow in the cliffs above, which makes its way to the bottom, cutting for itself a path in which it trickles unmolested, until it escapes beneath the heap of rubbish which begins at the base of the buttresses. The same form is repeated in endless rows, until the top of a flat table land is reached, where the beholder will find his elevation to be from six hundred

to eight hundred feet, on the border of a slightly undulating and unbounded plain, which is nearly as barren as the sandy deserts of Africa.

The latitude was 74° 31′, and the longitude at four P.M. was 88° 20′. Our progress to the westward was but slow, from the fact that the wind was right down Barrow Strait. We stood off to the S.W. for four hours, to examine the state of the ice in the vicinity of Leopold Island. After getting within fifteen miles of the island, a small stream of ice came in our way, for which the ships were put upon the other tack. At such a distance from the north shore, we could see Cornwallis Island and Cape Hotham very distinctly. The sky was very clear, and highly favourable for viewing distant objects. The sun set, and the moon rose about a quarter past nine o'clock. This was a very agreeable interchange, and one that we had become unaccustomed to since we entered the Polar seas. It reminded one of what is inseparable from his home, and, were it not for a few "molleys" (Fulmar petrels), a whale, and two sword-fishes that were seen, he might easily fancy he was sailing on the seas around the British coast.

August 24th.—As we plied to the westward along the north shore of Barrow Strait, the water was very smooth, and there were occasional streams of ice,

which was very much decayed. It rarely exceeded one or two feet in thickness, and often had large quantities of shingle on it, which gave rise to the idea that it was coast ice, and that open water must have been here for some considerable time. The coast ice, bearing away mud and stones from the shore, can only come out when the ice in the adjacent sea has drifted away, or become dissolved. The fragments of ice containing foreign matter seemed to be perforated all over, as if some of the pieces of rock had passed through its entire thickness, and made their escape to the bottom. There was no resemblance whatever between this ice and the "honeycombed," or "rotten" ice, which had been so often seen on the eastern shore of Davis Straits. The one had a degree of hardness and cohesiveness, although it was perfectly riddled with holes, which enabled it to resist the separating influence of the rippling waves; the other was so soft, and had such a natural tendency to separate, that the least motion in the water destroyed it very much. In the one the influence of the sun's rays was conveyed through a medium possessing powerful conducting properties; in the other through no such medium, through none, in fact, except the water which would diffuse it throughout the entire mass.

There was a smart breeze during the day, which

enabled us to make some progress to the westward; Cape Hurd and Radstock Bay were passed, and Caswall's Tower, Cape Ricketts, and Gascoyne Inlet could be seen very plainly. The land was not covered with snow to any extent, except in valleys, which protected large quantities from the action of the sun.

The weather was a little thick and foggy; but this continued only for a short time, after which it became gloomy and squally, and ultimately there was a drizzling rain. Towards midnight the wind increased considerably, and often swept round the bold bluffs with a degree of violence that threatened to carry away our spars, or to upset the ships, as they leaned over in the water.

Three ships were observed off Cape Hurd and Cape Ricketts on the afternoon of yesterday, and the same ships were seen several times this day. One of them appeared to be one of H. M. steamers, and it was very probable that one of the remaining two was the Assistance; but it was impossible to make out the third, which appeared to be a vessel of nearly the same tonnage as the "Sophia."

CHAP. X.

DISCOVERY OF WINTER QUARTERS.

Beechey Island. — Wellington Channel. — Traces of Sir. J. Franklin. — Abundance of Animals. — Land supposed to be seen across the Channel. — Barrier of Ice. — Young Ice. — Water upon the Ice. — Freshness of Water upon the Ice. — Interest felt in the Search. — Party on Shore exploring. — Traces found. — Opinions. — Line of Search and Route of the Missing Ships indicated. — Arrival in Union Bay. — Winter Quarters discovered. — Finger Post found. — Tin Canisters. — Absence of Documents. — Boat sent to Cape Ricketts. — Record left by H. M. S. "Assistance" at Cape Riley. — Report to Captain Austin. — Explore Gascoyne Inlet. — Leave Union Bay. — Communication with H. M. S. "Assistance." — A great many Bears seen. — Soil at the Cairn dug up. — Suggestion to open the Graves. — Causes of Death.

August 25th. — DURING the early part of the day there was a smart breeze, which forced us to shorten sail; the sky was overcast with dense cumulus clouds, which drifted rapidly before the wind. In consequence of our close approach to the ice, the temperature of the water came down to +32°, and the temperature of the air was also below its average, owing to the wind blowing over a large tract of ice and land. About five o'clock the wind began to moderate a little, but it was still squally, and a little

caution was requisite in passing some of the bold bluffs, such as Cape Riley and Beechey Island presented. The Wellington Channel was opening out to our view, and we could see the three ships already alluded to endeavouring to get to the westward; but the pack in Barrow Straits left too little room between itself and the fixed ice in the channel, for the ice there had not yet started.

The small ship we had seen on the morning of the 19th, belonged to the American expedition. She had parted company with her consort during the gale of the 20th, and had picked up a boat belonging to H. M. S. "Intrepid," which that ship had lost in Lancaster Sound. The "Lady Franklin" was visited by a boat from her, to make inquiry whether we had seen her consort coming up the sound, and to report that traces of the missing ships had been found at Cape Riley by the "Assistance" and the "Intrepid;" but they were of a very doubtful nature; and it was impossible to arrive at any conclusions with regard to them, except that they proved, that the ships of the missing expedition, or parties from them, had been at Cape Riley, and also at Beechey Island.

The "Lady Franklin" showed signals to the "Assistance," conveying some information respecting the "North Star;" but they were not taken notice of,

owing, I suppose, to the attention which all on that ship were paying to the motions of the "Intrepid," which had been despatched in the direction of Cape Hotham. A little to the eastward of mid-channel, the "Assistance" was caught among the ice about noon; and in less than an hour, the "Lady Franklin" was at the same ice, within a mile and a half of her. It was nearly calm, and there was a slight fall of soft snow, which overcast the sky, but did not obscure the sun. The sea was as smooth as oil; and thousands of seals, in which one could distinguish three species — the ocean or Greenland seal, the bearded seal, and the common seal, — were seen taking their pastime in the water. It is amusing to behold numerous groups of seals chasing one another on the surface of the water. They do not appear to be at all ferocious to one another, which makes the scene all the more agreeable. White whales were also seen in great abundance, and their peculiar mewing sound beneath water was often heard by persons sitting in the cabins. If it had been any other day but Sunday, I am not sure that we should have been honoured with so many playful companions. The temptation was not sufficiently powerful, and our wants did not demand interference with them; so they were permitted to pass the day unmolested, with a

promise that to-morrow, time and circumstances permitting, we should have some sport among them.

At two o'clock in the evening, Mr. Penny went on board H. M. S. "Assistance," which by that time was closely beset; her tender being beset six or eight miles farther on towards Barlow Inlet. On his return to the "Lady Franklin," we all learned that the "Assistance" had found traces of the missing ships at Cape Riley and Beechey Island, but of such a nature as not to leave the slightest impression on the mind at what time or under what circumstances the expedition had been there. Captain Ommanney was disposed to push to the westward as soon as the ice opened out to set him free. Mr. Penny thought it would be proper to examine the eastern shore of the Wellington Channel, which still presented a continuous sheet of ice, from a point about seven miles north of Cape Spencer to Barlow Inlet; and, with this object in view, he left Captain Ommanney. The ice in the channel was in some parts very much wasted; in other parts, again, it appeared to be fifteen to twenty feet thick; but of course such a thickness could only be owing to pressure.

The officers of the "Assistance" and of the "Intrepid" were divided in their opinions, with respect to a continuation of land across the top of the

channel. Some of them asserted that they had seen it, while others maintained with equal positiveness that what had been seen was not land, but open water. Each had his abettors in our Expedition,—Mr. Manson with the former, and Mr. Stewart with the latter. However, no one, so far as I knew at the time, could say, with any degree of certainty, that there was either the one or the other, and bring forward convincing proofs of the truth of his assertion.

At nine o'clock in the evening, our ships were cast loose, and steered towards the eastern side of the channel, along the edge of the fixed ice, which was very hummocky from recent pressure. The sky was overcast throughout, and there was a gloomy appearance pervading the whole atmosphere. There were occasionally very slight showers of dry snow; but at no time were they so close as to obscure vision within six or seven miles close along the horizon. Young ice formed on the water, at the edge of the fixed ice, where it was still, and probably also colder than elsewhere, from its proximity with the fixed ice. The temperature of the water was 30°. Since we came in between the ice in Barrow Strait, and the ice in the channel, the temperature of the air was +34° to +30°. Before night closed in around us, we observed the "Assistance" moving

to the westward in the direction of Cape Hotham and of the south shore of Cornwallis Island. These places, Captain Ommanney intended to have carefully examined, and there it was determined he should rendezvous for Captain Austin's detachment of the searching squadron.

August 26th.—At one o'clock A. M., the ships were made fast to the floe, to take some water from it, and to wait until the weather should clear up.

The water which accumulates on the surface of ice formed on the surface of sea-water is generally fresh enough for culinary purposes. If it is in the least brackish it does not suit for tea or coffee, and is exceedingly disagreeable with spirits. The whalers frequently test its purity by taking half a tumbler of it with a little spirits. In this way the palate will detect the least brackishness. It is only after the sun has been beating upon a floe for a considerable time, and after it has relieved itself from the first water formed upon its surface, that the water found on it will be fresh. I recollect seeing the whole of the fixed ice in Ponds Bay on the 26th of June present one continuous sheet of water, which could not be used in preparing our food. It was the first water that had appeared that season on the surface of the ice, and in some parts it was a foot deep. In the course of a week it drained through

the substance of the ice, increasing its porosity, and removing from it more than three fourths of the salt which it contained. There was, however, at the side of the same land ice a small pool, which had no communication with the principal surface water, and in it the water was found sufficiently fresh for our use. The water which is found on the "middle ice" is as fresh and wholesome as any spring water: it is owing to the same process of percolation, which the first water that forms on a new floe has to pass through before it can escape. While we were detained with the steamers in Melville Bay, a marine had been sent for water to the floe. He found that the pool dried up before he had enough, and, thinking that it was owing to the water being taken away faster than it could seek its way through the ice in the bottom of the pool, he sent his ice chisel through it, and enlarged what he considered to be the communication. He had an abundant supply of water, but it was salt. After he had watered the ship, as far as was necessary at that time, he learned, by dear-bought experience, that it would suit ill to dig a well in Melville Bay over a depth of two hundred fathoms of sea water.

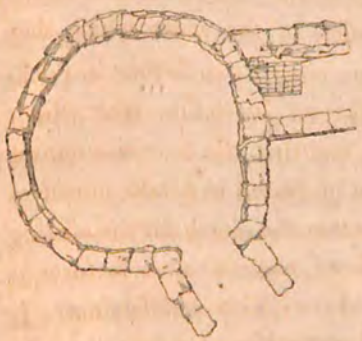
Since we had heard of the traces of Sir J. Franklin everything that deviated from nature attracted attention, if it were only a few particles of earthy matter on the ice, or even the dung of any animal, such as the fox or the bear.

After casting loose from the ice, and proceeding to the eastward with the ships, Mr. Penny and Mr. Stewart, together with a boat's crew, accompanied by Mr. Goodsir and Mr. Petersen, went ashore, to explore the coast northward from Cape Spencer. We watched the progress of the party along the coast until they reached Cape Spencer, where, in the evening, they were observed embarking and pulling to the ships.

During the day, the weather was almost perfectly calm, the sky was overcast with a dense misty haze, and towards evening there was a great deal of soft snow. The temperature of the air was as low as +27°, and that of the water 29°, but the latter was nearly stationary at 30°. The ships were, for the most part, within a few hundred yards of the ice in the channel, which, as has been already observed, had pools upon it. There was a covering of ice on the surface of the water which they contained, varying from one to two inches in thickness. This was a distinct indication that winter was fast approaching, and that the time was not far distant when we would be forced to betake ourselves to winter quarters, whether the search for the missing expedition had, or had not, assumed such features as should enable us to do so with satisfaction. It was most painful and annoying to reflect that the

best part of the season for exploration had passed away long before this time, in spite of our utmost efforts to penetrate through the ice to the scene of action — the Wellington Channel. From the appearance of the ice in the channel, we could hardly look forward to a speedy disruption amongst it even now, although Captain Parry, in 1819 on the 23rd of this month, saw no impediment in it. At that time, however, there might have been ice in it beyond the limits of vision from the crow's nests of his ships, for they crossed its entrance in a line from Beechey Island to Cape Hotham.

At six in the evening our party returned, bringing off unexceptionable traces of extensive parties belonging to the missing expedition. About six miles N. of Cape Spencer, the site of an encampment was discovered, where there was a hut made of stones, of which the accompanying figure is a representation of the base; for this I am indebted to the kindness of Mr. Goodsir. The floor was neatly paved with thin and smooth stones. The wall



was generally about four feet in height, and it enclosed a space twelve feet in diameter. Immediately in connection with the wall outside, there were two projecting walls, about four feet apart, which enclosed a space that appeared to have been a fire-place, from the ashes and other relics of cookery which it contained. A great many articles were brought off by the party. These included soup canisters, some of which had been used as cooking vessels, while others had the labels entire. "Goldener's Patent" was a very common form; and there was one bearing the name "Mr. M'Donald" written in a business style. Some of them were a good deal corroded, especially where the paint had been removed in the opening, which in most cases appeared to have been very roughly performed. The painting outside and the tinning inside, when entire, prevented corrosion. There were pieces of oak, such as staves of small casks; the end portions of a small cask with the words "mixed pickles" scratched on them; also larger pieces of oak, such as might have been procured by splitting up the knees or the doubling of a ship, and they were charred at the ends as if they had been in the fire; the bones of birds also a little burned; but there were no beef bones; part of the leaves of a book (MS.) with some markings on them, and part of a newspaper bearing date September 1844; portions of rope, very much chafed, but

easily distinguished as belonging to the Royal Navy by the middle yarn; also torn mittens, cotton rags, and blank paper, all of which the wind had driven beneath the stones. The wall of the tent or hut had been rendered impervious to the wind, by the interstices being packed up with moss and bits of paper. Mr. Petersen said it was about four years since the hut had been built, from the appearance which everything connected with it had assumed by the action of the weather. In this respect, Mr. Petersen's opinion would be of great value, as it could be relied upon, from his extensive experience within the Arctic Circle. There were a few handfuls of coals in the fireplace, together with birds' wings, tails, heads, feathers, and bones, some of which appeared evidently to have been in the fire. The track of a sledge was discovered, and the marks of the runners, which were very distinct, were found to be two feet apart. The bones of whales were observed on the land, at the same place as the tent; but they appeared to have been there for ages.

From such an accumulation of materials, relics of parties belonging to the missing ships, and in the entire absence of documents left by them, various inferences were drawn, and questions resulting from such inferences were put, which ended in a number of opinions of a purely speculative character. It was

not doubted by any one, that parties belonging to the "Erebus" and "Terror" had been here for a considerable time; and there were few or none to dissent from the general opinion, that it had been at a period four years previously. A line of encampments was discovered parallel with the eastern shore of the channel, which gave rise to the opinion, that the party which had left them had been retreating from a position to the northward, at no great distance, where, probably, the ships had been lost. The fact that beef bones were found at Cape Riley, while none were found at this encampment, was almost sufficient to refute that opinion. Although the route pursued by the missing ships was still too doubtful, to have taken the least possible advantage of the three stations, where parties from them appeared to have touched, it cannot be denied that a line drawn from the one to the other continued onwards would lead directly up the Wellington Channel, and afford an amount of encouragement to search for them in that quarter, which neither Melville Island nor Cape Walker could hold out to persons searching in the direction of those places. Mr. Penny resolved to have the coast thoroughly examined, north and south of Cape Spencer; and, with this object in view, he gave orders to keep in its neighbourhood during the night.

27*th.* — After a heavy fall of soft snow, last night and this morning, we had rather a strong breeze from S. W., which resolved into squalls as the snow cleared away, and the sky began to appear between the drifting clouds. The sky only appeared for a few hours between eight and eleven o'clock, after which it became overcast with dense blue clouds, casting their gloomy shades upon the already too gloomy appearance of everything around us.

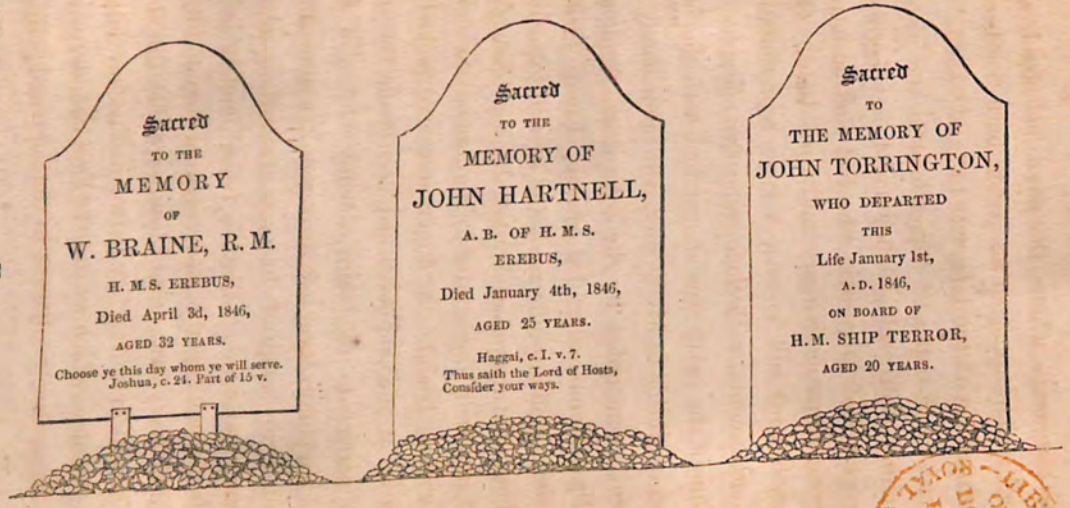
After plying for three hours, in the direction of and to the southward of Cape Spencer, we got hold of a floe fixed in a bay between it and Beechey Island, and secured the ships to it at eight o'clock in the morning. The "Felix," under the command of Sir John Ross, and the Expedition from the United States, were moored to the same ice. Mr. Penny detailed an account of yesterday's proceedings to the commanders of those vessels, and sent a party, immediately that the ships were moored, to Beechey Island, to examine it as carefully as possible.

The party was composed of all the officers of our expedition, except the chief mates, and it was under the orders of Mr. Stewart, commander of the "Sophia." Traces were found, to a great extent, of the missing ships; tin canisters in hundreds; pieces of cloth, rope; wood in large fragments and in chips; iron in numer-

ous fragments where the anvil had stood, and the block which supported it; paper, both "written" and "printed," with the dates "1844" and "1845:" sledge marks in abundance; depressions in the gravel resembling wells, which they had been digging; and the graves of three men who had died on board the missing ships in January and April 1846. On the opposite page will be seen a rude representation of the monuments, with their respective epitaphs.

One of the party was despatched with the intelligence of all this to Mr. Penny, who immediately came ashore, accompanied by Sir John Ross, Commander Phillips, Commander De Haven, Lieut. Griffiths, and the remaining officers of the several expeditions.

These were unequivocal proofs that the missing ships had spent their first winter in the immediate vicinity of Beechey Island. A finger-post was picked up, which we at once supposed had been made use of to direct parties to the ships during winter, if they should happen to have lost their way in a snow storm. Captain Parry adopted the same precautions around his winter quarters at Melville Island, and it is not improbable some of the posts may be found after a lapse of thirty years. Our ideas wer that the ships had wintered in a deep bay between Beechey Island and Cape Riley, which we called "Erebus and Terror" Bay. Immediately adjacent to the supposed position



LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC SOCIETY

of the ships, we found the site of a large store-house and work-shop, and smaller sites which were supposed to have been observatories and other temporary erections. A great number of coal-bags containing patent fuel in small quantities were found scattered in the vicinity of the sites of these erections, and several pieces of canvas, such as is often used about the deck of a man-of-war; one of the pieces had the letters *T-e-r-r-o-r* written on it. The meat-tins were piled up in heaps in the same regular manner as shot is piled up; each had been filled with loose shingle, and when the tiers of a single layer were completed the interstices were also filled up with shingle. In this way several mounds were raised to a height of nearly two feet, and they varied in breadth from three to four yards. Six or seven hundred tins were counted, and many more besides these were dug up and emptied out in search of documents.

A cairn was found on the south-west side of the island, which contained a paper left by Captain Ommanney; but there were no papers found anywhere that had been left by the missing ships. Every precaution was taken to secure a faithful search of the whole island, but the result was the same in all.

The same mystery still shrouded the fate of Sir J. Franklin and his companions. The beach, which

abounds in organic remains, such as coral, in highly disintegrated fragments, received impressions of the feet of, I presume, all in his expedition, which it still retains as memorials of many a visit from the lost and the loved. How interesting it would be, to have thence a stereotype of the conversation between boon companions on many a cheerful and quiet walk, and no less interesting would it be to have the plans which the Commanders of the Expedition were wont to con under the clear blue sky, the twinkling stars, the flashing and evanescent Aurora Borealis, and the bright shining moon, of the Polar Regions, during their long, but I hope not dreary, winter. Could secondary limestone but speak, with its abundant remains of animals, which had their existence in epochs of our earth when man was not known,—could the beautiful yellow poppy (*Papaver nudicaule*), which, on the return of summer caught and pleased many an eye in the missing Expedition, as its representatives in other climates please the mind, could it be but gifted with the power of utterance, — we should have had hosts of witnesses to convey that intelligence to us, which, in the absence of documents, was denied. To us it appeared truly remarkable, that winter quarters had been left without leaving records to shew that British ships had been there, if not also to give an idea of the route they intended to

pursue. Perhaps it was considered that the graves would be evidence enough that they had wintered there; and of their route, after getting clear of winter quarters, they would know so little themselves, depending entirely upon the state of the ice in Barrow Strait and the Wellington Channel, that it would be altogether impossible to leave documents which they could be certain would not mislead parties coming after them. Mr. Penny no longer thought that they had been retreating; and he gave it as his opinion that they used the encampment north of Cape Spencer as a "look out" station for the channel.

A boat party, of which I happened to be one, under the command of Mr. Stewart, was sent down to examine Cape Ricketts, Gascoyne Inlet, and the intermediate line of coast, with discretionary power to continue the search beyond Cape Ricketts, if any traces should be found there to encourage us farther to the eastward.

At three o'clock in the evening we left the ships, and proceeded eastward until we reached Cape Riley, where we landed, and found traces of the missing Expedition, as well as papers that had been left there by H. M. ships "Assistance" and "Intrepid," the "Albert," and the two American ships, the "Advance" and "Rescue." The following is a copy of the paper left by Captain Ommanney of H. M. S. 'Assistance."

"H.M. Arctic Searching Expedition.

"This is to certify, that Captain Ommanney, with the officers of H. M. ships 'Assistance' and 'Intrepid,' landed at Cape Riley on the 23rd of August, 1850, where were found traces of an encampment; and collected the remains of materials, which evidently prove that some party belonging to H. M. ships have been detained on this spot. Beechey Island was also examined, where traces were found of the same party. This is also to give notice that a supply of provisions and fuel is deposited at Whaler Point, Port Leopold. H. M. ships 'Assistance' and 'Intrepid' were detached from Captain Austin's Squadron off Wolstenholme Island on the 15th inst., since when they have examined the north shores of Lancaster Sound and Barrow Straits without meeting with any other traces. Captain Ommanney proceeds to Cape Hotham and Cape Walker, in search for further traces of Sir John Franklin's Expedition.

"ERASMUS OMMANNEY,

"Captain.

"Dated on board H.M.S. 'Assistance,'
off Cape Riley, this 23d August, 1850."

After examining the papers left by the ships, we continued our route eastward along the coast, landing very frequently. Immediately eastward of Cape

Riley three white hares (*Lepus glacialis*) were seen, and one of them was shot. The antlers of the reindeer were found, but none of those animals, or their recent dung, could be seen. On arriving at the ships next day, the hare was put into the scales, and found to weigh eleven pounds, which was rather remarkable, when compared with the scanty vegetation upon which these animals have to subsist. I suppose they have to seek it over a wide extent; which, since they are not very numerous, is a compensation for its scantiness. The small proportion of the juices of Arctic plants renders them much more nutritious, when taken into the stomachs of animals, than they would prove to be in a warmer and a more humid climate.

When we were off Gascoyne Inlet, we observed H. M. ships "Resolute" and "Pioneer" coming steaming up Barrow Straits, within a few miles of the land; and as it would take us but little out of our way to go on board, the boat was directed so as to cut them off. As we approached the ships every eye was intent upon us; the boat might readily have been recognised as one of the boats of the "Lady Franklin;" but then, how could this be, since we had been lost sight of off Cape York in a calm, far behind the advancing ships. If there were conjectures with respect to the boat, there were still

more with respect to her crew; and I am certain it occurred to some of the officers, that there were among us persons belonging to the missing ships. In a short time we got on board, and reported to Captain Austin our proceedings since we had parted company off Cape York, not excepting the discovery of the "winter quarters" of the "Erebus" and "Terror" at Beechey Island, and their encampments northward of Cape Spencer. The discovery of the first traces of the missing ships at Cape Riley, on the 23rd of August, by Captain Ommanney, was also reported, and a copy of the paper deposited by him at that place was read. The position of the "Assistance" and the "Intrepid," to the eastward of Cape Hotham, was given as correctly as we knew; and to the enquiries which Captain Austin made respecting the depth of water close along the land, lest he should have to approach it in keeping clear of the ice in the Straits, we replied that he must not venture near the shore where the land is very bold, any more than where it is low and jutting out into the water, for the water shallows at nearly the same distance from both. In proof of this, we mentioned (or could have mentioned) that one of the American ships had been on the ground two or three days previously. After conveying this intelligence, which must have been full of interest to them, we left the "Resolute," and

landed at Cape Ricketts, which was closely examined down into Gascoyne Inlet, without finding a single trace of the missing ships; whereupon, Mr. Stewart resolved upon returning to the ships.

August 28th.—At one o'clock in the morning we embarked at Cape Ricketts, and after struggling with the ice and the wind for four hours, we arrived at the ships in Union Bay, where we found H. M. S. "Pioneer" aground, about a quarter of a mile from the north bluff of Beechey Island. This name was given to the bay, between Beechey Island and Cape Spencer, to perpetuate the day on which so many of the ships met in the vicinity of the "winter quarters" of Sir John Franklin's Expedition. There was a smart breeze from the northward, which cleared a good deal of the loose ice out of the Wellington Channel; but as it had veered round from west to north, it brought a large quantity of ice into Union Bay, which beset the ships, until the next change of tide took it clear of the fixed ice in the bay, and then the wind drifted it south of the north bluff of Beechey Island.

From the edge of the ice in the middle of the Wellington Channel to Union Bay there was open water, and as the wind swept round Cape Spencer it brought a short sea into the bay, which was breaking up the edge of the fixed ice in it, where the

ships were moored. Mr. Penny thought a favourable change would be wrought upon the ice in the Channel by what appeared to be such a suitable wind; and with the view of being present if it should open; he ordered the ships to be cast loose and sail to be made. It was remarkable with what ease and readiness the "Lady Franklin" left the edge of the ice, although the wind was almost at right angles with it. The "Sophia" had much less freedom in this respect than the "Lady Franklin;" however, she too succeeded in getting under weigh with very little trouble, and, I have no doubt, much to the astonishment of the whole searching squadron, for probably there was not a ship among the whole fleet that could vie with the two little vessels in our expedition in quickness of sailing and dexterity of evolutions among the ice. These remarks are ostentatious; but in spite of any such impeachment, the builders are entitled to all that has been said with respect to the qualifications of the vessels on which their skill had been so successfully bestowed.

After proceeding to the westward as far as the middle of the Wellington Channel, we found the ice in Barrow Straits still in contact with the ice in it, nor were there any chances it would open out soon. The ice in the channel itself continued fixed from side to side, and with the exception of a few fragments

that drifted out of it, the previous week seemed to have altered it very little.

August 29th.—At eight o'clock in the morning, a boat was sent to H. M. S. "Assistance," which was seen beset to the westward. The object of this was to communicate to Captain Ommanney the results of our explorations northward and southward of, and on Beechey Island. Mr. J. Stuart of the "Lady Franklin" was one of the party. After going with the boat as far as the open water permitted, the party were seen hauling it out of the water, and then having left it on the ice, they proceeded, on foot, towards the ship.

Before noon, the wind veered to the westward, and threatened to bring the ice in Barrow Straits around the ships, a circumstance which was not, by any means, to be desired. To avoid as long as possible getting beset, we stood to the eastward, and at four o'clock in the evening we again entered Union Bay, where we found the other ships almost as we had left them.

There was a good deal of snow falling, and the wind blew rather keenly from about W.; the sky was overcast with the snow, and with very gloomy and surly-looking clouds. There was a little anxiety respecting the boat party, but no dangers were apprehended so long as the wind kept following them on their return. They could launch the boat from

one lane to another over the ice, and in such cold weather, the exercise would keep them warm.

August 30th.—The boat party returned from H. M. S. "Assistance," and reported that her tender, the "Intrepid steamer," had sustained some serious damage about the stern post. There had been very severe pressure among the ice off Barlow Inlet, where the ships were lying. Mr. Stuart says they saw a great many bears in the channel, some of which they could have shot very easily, but the circumstances under which they were placed, were such as rendered sport impossible, it being quite enough for them to acccomplish their journey in such exceedingly bad weather. Before coming so far as Union Bay, they went on board one of the U. S. ships, which was lying northward of Cape Spencer, where they received refreshments, and were very kindly treated.

Mr. Stewart, Commander of the "Sophia," and Mr. Goodsir accompanied by a party from H. M. ships "Resolute" and "Pioneer" went on a journey in the direction of Caswall's Tower, but the extreme violence of the weather,—constant snow and sleet,—was more than reason enough for returning after they had gone half way. Traces were found by them of sledges, and of excursion parties from the missing Expedition.

Beechey Island was examined again and again without making any new discoveries. A party went to

the cairn on the S. W. bluff with picks and shovels, and with them they dug up the soil as far as it was practicable, thinking that cylinders containing papers might be found buried therein; but still the results were exactly the same. It was suggested to have the graves opened, but as there seemed to be a feeling against this really very proper and most important step, the suggestion was not reiterated. It would have been very interesting to have examined into the cause of death; it is very probable there would be no difficulty in doing this, for the bodies would be found frozen as hard as possible, and in a high state of preservation in their icy casings. The graves, as will be seen from the inscriptions, were opened and shut when the frost must have been intense; hence the bodies would then become quite hard, and if the snow about the graves should sink into them after thawing had commenced, the greater coldness of the soil underneath the surface would congeal the percolating water, and form a perfect icy casing, which, at a depth of even a single foot, would defy the action of the sun throughout the whole summer. It is very improbable they died of scurvy; indeed, it is almost impossible that this disease could have appeared in the Expedition at a period so early as to prove fatal to those first attacked,—on the first days of January. Suppose the disease was scurvy, I think the least

space of time in which it could have destroyed life, where such measures would be adopted to retard its progress, could not be less than three months, and in that case it must have appeared in the Expedition so early as the end of September, — two months after the whalers had brought despatches from Sir John Franklin, and only five months after they had left England. The cause of Braine's death, which happened in April, might have been scurvy supervening upon some other disease. The first two deaths had probably been caused by accidents, such as frost bite or exposure to intense cold in a state of stupor, or to diseases of the chest, where there might have been some latent mischief before leaving England, which the changeable weather in September and October rekindled, and the intense cold of November and December stimulated to a fatal termination.

CHAP. XI.

PASSAGE FROM BEECHEY ISLAND TO ASSISTANCE BAY.

Prospects of getting clear.—Fossils.—Character of the Land.—Red Snow.—Character of the Bottom in Union Bay.—Dredging.—Ships leave Union Bay.—Party at Cape Spencer.—Open Water to the Northward.—Birds and other Animals.—Whales.—Rapid Tides at Cape Spencer.—Direction of the Tide.—Young Ice.—Fixed Ice in the Channel.—Sailing Vessels in Bay Ice.—Capturing Seals.—Seals fattest in Winter.—State of the Ice in the Channel.—Plying Northward.—Prospects.—H. M. Ships beset.—Plying Westward.—Arrested by the Ice.—Griffiths Island.—Arrangements for future Proceedings.—Attempts to reach Cape Walker.—Meet the "Felix."—A School of Walruses.—Habits of the Walrus.—Difficult Navigation.—A dark Night.—Danger of getting beset.—Getting out of a Lee Pack.—Dropped Anchor.

September 4th.—The weather was very stormy during the four previous days; the wind prevailed up Barrow Straits, and set the pack in it closely together, westward of a line direct from Cape Ricketts to Whaler Point. Union Bay was full of ice, and, for fear of pressure, we cut a dock, and hauled the ships into it. It was quite impossible to get out of the harbour, and to proceed to the westward was still more so. It appeared to be very doubtful when the ice would clear away from the land, and upon these doubts our hopes and fears rested continually. The temperature

of the water never rose above 30°, and that of the air was rarely above +32°, but it was often down to +27°. On several occasions the snow, soft and sleety when it fell, became frozen over, and connected the pack ice firmly together on the surface, so that one could walk over it with tolerable safety.

Beechey Island was often visited, although the state of the weather rarely permitted of longer excursions. Geological specimens were obtained in great abundance. *Favosites*, *Encrinites*, *Catenipora*, *Cyathophyllum*, *Porites*, and *Fucoid* impressions were very common forms of organic remains. At Cape Riley, and also on Beechey Island, *Favosites gothlandica* was found almost everywhere in great abundance, but especially at the latter place, where it occurs *in situ*. It has a beautiful sort of honeycombed structure, and some of it is so light that it floats in water for a minute or two after being newly introduced.

Among the loose shingle, where there were accumulations of finely divided calcareous rock in the form of tertiary deposits, bivalve shells in a free and perfectly detached state, could be picked up in baskets-ful. They were on the surface, and also in the substance of the deposits, and the elevation at which they occurred varied from the level of the sea to a height of five or six hundred feet. They appeared on the

surface of the mounds, for the reason, that part of the finely divided earthy matter had been removed, either by rain or melting snow, or by the wind, when in a dry state. The surface of the land, except on the sites of those deposits, was everywhere exceedingly rough, and it proved most destructive to boots or shoes when one had to walk much. This roughness arises from the action of snow or rain-water containing carbonic acid, which attacks the softest parts of the rock, and removes it. The water thus charged with lime in solution escapes to the under surface of the fragments of the shingle, whence a portion of it evaporates and leaves a rough coating of earthy matter resembling miniature stalactites. The hollows along the beach, where there had been accumulations of fresh water at an earlier period of the season, although now quite dry, had a thick coating of green filamentous algæ. In some of the hollows, especially those that were shallowest and did not contain mud at the bottom, the red snow-plant was found by Mr. Goodsir, encrusting the small stones. When there was water in the pools, the bottom had a crimson tinge, which was never imparted to the water; on the dry stones the deep red had faded, but it was again restored on the re-application of water.

The bottom in Union Bay is composed of unpolished shingle, and in this respect it resembles the land. The

depth varies from the beach outwards; about half a mile from the land, where our ships lay, it was fifteen fathoms. The dredge brought up sea-urchins and brittle stars (*Ophiuridæ*) in myriads; sea anemonies, of not very large size, adhering to the fronds of Laminaria; crustaceans of various orders, among which could be recognised the *Idotea baffini*, *Gammarus loricatus*, and *Entomostraca* belonging to the genus *Cyclops* adhered in thousands to the palmated portion of sea-weed. Fragments of rock, that came from a depth of twelve to fifteen fathoms, were variegated by calcareous incrustations (a Nullipora), of a red and greenish colour, containing perforations which extended into the substance of the rock, and contained fleshy-looking creatures, that could only be detected by breaking up their habitations, and seemed to possess little more of the signs of life than mere irritability. In some of the perforations bivalve molluscs seemed to have taken up their abode, and in one I observed a sea-urchin of not more than two lines in diameter. How these creatures were to leave their temporary abodes, after they had become too large for the apertures by which they had entered, was a question which they would find difficult to solve, when it might be too late, and they should be already in their unyielding mausoleum. The mollusc, which resembled the genus *Mytilus*, might possess a lithodomous character; but it

is certain that the sea-urchin, with its brittle spines, would be quite incapable of working its way through the hard rock. These variegated incrustations were in their turn incrusted by beautiful zoophytes, which have a great resemblance to the genus *Eschara*, and are spread out in little patches of network of the utmost regularity. There were also Serpulæ in great abundance. Minute algæ, as well as some of the large laminated species, were frequently brought up in the dredge. The former included a beautiful reticulated, three equal-sided, siliceous Diatoma, the frustules of which are about $\frac{1}{200}$ of an inch in breadth, and cohere by two of the angles, the other angle being free.

There was also another diatoma which resembles in outline the genus *Biddulphia*, figured by Ralfs in the second volume of the Transactions of the Botanical Society of Edinburgh. It is very minute, but sufficiently large to distinguish the reticulations with a magnifying power of two hundred and eighty diameters. Perhaps the triangular Diatoma is a new and undescribed species.* The weather appeared a little more settled in the course of the day than it had

* Since writing the above, I have been informed by Dr. Dickie, Queen's Coll., Belfast, that this is the *Triceratium striolatum*, figured by Kutzing in his "Bacillarien oder Diat." taf. 18. fig. x. The other is very probably the *Odontella obtusa*, also figured by the same author.

been for some time. The sky, which had been densely overcast, cleared up, and beautiful fleecy clouds were spread over it. The wind was variable, but chiefly westerly, and it varied in force from a mere calm up to a three or four knot breeze. As night approached, and the clear and starry sky was open to our view, young ice formed very rapidly on the water around the ships, but fortunately it went off with the tide as fast as it appeared on the surface. The loose pack was also slackening off and leaving room for the ships to get clear. This was owing probably to an influx of water into Barrow Straits during the south-easterly winds, which was now beginning to recede, and although no opening occurred among the ice in the offing, it could not fail close in with the land.

September 5th.—The morning was beautifully clear, and distant objects were remarkably visible; there were hardly any clouds upon the sky, and it was nearly a perfect calm. At an early hour our two ships, and H. M. ships Resolute and Pioneer, were beginning to move, and prepare to leave Union Bay. The American Expedition had left it some time previously. Sir John Ross did not appear disposed to move in the mean time, because he did not think the opening in the ice to the westward sufficiently large to permit the "Felix" to pass through. In the course of a few hours,

however, she was seen coming out of the harbour with all her sails set. At noon the ice closed in with Cape Spencer before the ships got through to the westward. The "Pioneer," with the "Resolute" at her stern, was at the edge of the ice, waiting patiently until a change of tide should open it out. We were immediately to the southward of Cape Spencer, in a space of open water which was generally free from ice, except when the wind brought in large quantities from the westward.

Captains Penny and Stewart, and a party from the "Lady Franklin," went ashore to Cape Spencer, to have a view of the ice in the channel, and in Barrow Straits. They ascended to the top of it, which is about seven hundred feet above the sea level. Open water could be seen northward of Cornwallis Island, and of an impenetrable barrier of ice in the channel. Drifting ice was clearly discerned in the water, and also an island completely surrounded by water. The refraction was very powerful at the time, otherwise objects at such a distance would be invisible beneath the horizon. The barrier of ice in the Wellington Channel would make the atmosphere over it highly refractive of rays coming from open water beyond it, where the atmosphere would be of less density than over the ice. The island appeared to be to the westward of the northern limit of the western boundary of the

the channel. The water extended beyond it on both sides, and, as far as persons could ascertain at such a great distance, there appeared to be no ice attached to it in any part. This discovery of the existence of open water beyond the ice in the Wellington Channel, enabled us to account for the flocks of ducks that had been seen flying down the channel during the preceding week. They might truly be said to have been on a passage, for I do not believe that any of them ever attempted to alight on the water near Beechey Island, and it is very probable that they came from the water we had now seen. We had already observed white whales and narwhals making the best of their way south, close along the land. On the evening of the 27th of August especially, while we were on an excursion to Cape Ricketts, white whales were observed keeping close along the land, and moving rapidly to the eastward. Previous to that time we had seen them, moving now one way, and now another; but since then, every one, without exception, that has been seen, was observed moving down the Strait in the direction of Lancaster Sound. In connection with white whales, Mr. Petersen has informed me, that they pass to the southward, in the month of October, so close along the coast of West Greenland, that they are taken in nets attached to the land, which the settlers and the natives lay out

for them, and in such numbers, that two or three hundred are generally caught every season at each of the settlements. He says, that one continued stream of these beautiful creatures are seen pouring southward for whole weeks towards the close of the season. The reason he assigns for their approaching so much nearer the land in the decline of the season than early, is, that they may elude the vigilance of their enemies the swordfish, which one sees very frequently in Baffin's Bay and Davis Strait after the ice clears away, but scarcely ever when there is ice. I believe the reason is a correct one, although it may appear strange that so many creatures should, year after year, be forced to make such "détours" to avoid the capricious gambols of an allied genus. When we observed them close to the land on the evening of the 27th of August, the ice in Barrow Straits was but a few miles from us, and no grampuses were seen since we entered Lancaster Sound, except two on the 22nd of August. Perhaps there may be some better reason for the habits of this creature, and the routes which it follows. They may depend upon greater facilities being thus afforded to them in finding their food; for it is well known that the young of several kinds of fish seek shallow water at certain periods of their growth. At the same time, it is remarkable what dread even

the common Greenland whale has of the swordfish or grampus. I recollect, one beautiful morning in October, when hundreds of huge whales, both young and old, were enjoying themselves in their native element, and were often seen leaping out of it like salmon, and falling with a thundering noise as if they had nothing to fear, a "school" of swordfish were observed in the offing, and in less than half an hour the whales were on their flight, and far out of our sight. The course northward, which the white whale follows, is along the ice early in the season, while in October it takes southward, close along the land. It is very doubtful whether those we saw in the channel had been in the water on the other side of the barrier, whence we believed the birds had been migrating into warmer regions for the winter. At all events, both birds and whales are apprised of the return of winter about the same time, and receive their summons from the same unerring hand, to depart from the ground which they occupy only for two or three months.

The party returned from Cape Spencer about four o'clock, and reported that they had seen H. M. ships Assistance and Intrepid, beset in the ice off Cape Hotham; the two U. S. ships were seen from the decks of our ships, seeking their way among the ice in the same direction as the "Assistance" and her

tender. The "Resolute" and the "Pioneer" got clear of the ice as it opened out at five o'clock, and then they steamed away to the westward after the "Assistance."

The evening was calm, consequently we could not advance in any direction without using our boats, and with them we were able to do very little. At 7 P. M. we were abreast of and close to Cape Spencer. The tide was sweeping round it, and carrying a quantity of heavy ice, in the form of floes and hummocks, along with it. Among this ice the ships were caught, and hurried along, at the risk of being brought with crashing vengeance into the face of a perpendicular wall of ice, thirty to forty feet high, which recent pressure had raised upon the level beach. They were often observed whirling round, shooting ahead and astern, now just about to run bow foremost into the enormous pile on the beach, now going after the broadside, in the direction of grounding hummocks, which were sufficiently high above water to destroy bulwarks, stern frame, and boats' davits, or even to carry away the bowsprit. To say the least of this, I do not think that ships could have been extricated from the position which ours passively occupied for two hours. The counter of the "Lady Franklin" was carried within a hair's breadth of a mass of ice that was taking the ground, although there were seven fathoms water, and in less than five minutes she

whirled round with the rapidly moving ice, until her bow was almost in contact with the ice on the beach. Her bowsprit, and all that appertained to it, would have gone to pieces in a moment in the face of these white icy cliffs. I am sure some of us, even those who had often witnessed the icebergs rifting asunder, were contemplating how to escape, when the crashing began that was every moment expected. At length we got hold of a large floe, which dragged us along until the space of open water north of us widened, and we got clear. This happy event occurred at 9 P.M., after which sail was immediately made, and in a few minutes we were once more clear of the ice.

As a question may probably be raised, from the direction in which the ships were carried, with the view of ascertaining the direction of the current, we need have no hesitation in making a few remarks in connexion with it. It will be observed, that Barrow Strait was full of ice, and that at noon it had come to the eastward, until the space between it and Cape Spencer became filled up. It did not fill up Union Bay at the same time, for the reason that there must have been a rush of water out of it, as it has no outlet to the eastward. At five o'clock in the evening, the ice eased off from Cape Spencer, and moved to the westward, and at the same time the current swept rather rapidly along this

most prominent part into the Wellington Channel, where it became comparatively slow. Presuming the flood tide to come up Lancaster Sound, and up the Wellington Channel, from Barrow Straits, the ice pressing upon Cape Spencer would be shifted westward by the advancing tide, and after a part of the water sweeping round Cape Riley had filled Erebus and Terror Bay, and then Union Bay, it would advance northward along Cape Spencer into the channel, carrying a quantity of ice from the edge of the pack, and inclining to draw the whole pack opposite the entrance of the channel into it. The ice pressing upon Cape Spencer and Cape Riley will shift westward, and the ice in the entrance of the channel northward, by the flood tide, and of course the opposite will obtain with the ebb. In seeking a passage to the westward from Beechey Island, if there is no wind, the tide to set a ship at liberty at Cape Spencer, will fix her in the middle of the channel.

After getting into the channel, our first object was to reach the fixed ice, and as there was a gentle northerly breeze, there was little difficulty in accomplishing this so far; but to get hold of it was impossible, for a large quantity of young ice had been carried against it, through which all our efforts to take the ships completely failed, and at midnight we were

closely beset among an accumulation of young ice, which the advancing pack had squeezed up. Our distance from the fixed ice was every moment becoming less, and ultimately we ran out a warp to it, and secured the ships. It was not necessary to have warps out then, but it was believed they would be required when the tide changed. As danger to the ships was apprehended from pressure between the pack and the fixed ice, the rudders were unshipped and slung across the stern.

When young ice is forming on an extensive sheet of water, bounded on the one side by the land or by fixed ice, and on the other by loose ice, it is never permitted to cover the whole extent of the water, when the distance between the two ices is increasing; because new openings are continually appearing among it, throughout its whole surface, and principally on the side that is next the fixed ice or the land. Again, when the distance between the two ices is diminishing, the young ice on the surface of the water begins to overlap, and to emit a sound which resembles that of distant cascades, and to the Arctic voyager it becomes exceedingly disagreeable, being a species of monotony of the most tiresome description. The ship is generally brought to a stand by it, and should it continue for six long hours, the whole period of an ordinary tide, the sound is

as audibly impressed upon one's ears at the end of such a long spell, as it was at the commencement.

September 6th.—Towards morning the wind shifted to the S. E., and began to increase gradually, for it had nearly died away at midnight. The sky was still very clear, and objects at a distance could be seen very distinctly. The ships which went to the westward in the direction of Cape Hotham yesterday, were beset a few miles beyond the middle of the channel, so that the ice must have closed in about them a little sooner than with us. This is what one might look for in the middle of the channel, where only a slight motion of the whole pack in Barrow Straits would be required; and it would happen soon after the tide began to flow westward, in which case, the ships there would have been beset between seven and eight o'clock.

At half-past three or at four o'clock in the morning the ice eased off, and before another four hours had expired, we had at least three miles of open water along the edge of the fixed ice. This moving to and fro of the pack proved very useful in destroying the young ice. We were often glad to see the pack advancing upon it, and throwing it into heaps, after it had proved such a serious encumbrance to us. Among young ice the efforts of the crews to extricate their ships very rarely succeed, especially in calm

weather, for boats cannot tow among it, and nothing can be done by means of lines, there being nothing to lay hold of. It is under such circumstances that steamers, whose propelling power in calm weather is independent of everything extrinsic, except the water at the screw, and a supply of water to the engines, have such a decided advantage over sailing vessels. They can advance, independent of wind and tide, so long as the power of the engines can overcome the resistance offered by the young ice, whereas sailing vessels must move passively with it; and if the season is pretty far advanced, it may increase in thickness so much in one night that, supposing a most favourable breeze to spring up on the following morning, they are carried dead to leeward; and after their poor crews have been toiling hard for twenty-four hours, exposed to a temperature far below the freezing point of water, they may be getting clear when the wind is dying away, and then, after a few feeble strokes of the oars, they are caught as before, and carried helplessly among ice, which will not so much as afford the pleasure of a comfortable walk over it. When a whaler becomes frozen in among young ice late in the season, the efforts of her crew to free her are equivalent to those of the crew of a sinking ship, although many times they are not so effectual; and if the young ice formation be

compared with the leak, it is not consoling to know that it is hourly becoming worse. Every day shews a marked diminution of temperature, and thereby the tendency to form young ice is increasing. With the fear of being caught among the young ice and held in its teazing grasp, it need not be wondered that we kept hold of the fixed ice, by the asistance of which we defied its utmost efforts to receive us within its influence.

At noon the wind increased to a strong breeze, and the sky became overcast with a misty haze, which obscured the land on both sides of the channel. It was that disagreeable lurid haze through which the sun can be discerned with difficulty in a large bright spot, which dazzles the eyes of the beholder. The temperature of the water was 29½°, and that of the air +36° to +32° during the southerly wind; but it had been so low as +27° some days previously.

The ice closed up the open water by the return of the tide, but large angular openings were still found among the floes, at the junction of the loose with the fixed ice. In these openings there were some large seals, one or two narwhals, and the same number of white whales, which had not yet taken their departure to the southward. Large flocks of ducks and brent geese were seen flying southward in the morning, when it was clear. A boat from the

"Lady Franklin" seemed to be very eager in attempting to capture some of the seals, several of which Mr. Petersen and others had shot, but unfortunately, they sank before the boat could get up to them. One or two, however, were obtained by means of great expertness in rushing in after the shot had been fired. Mr. Petersen says this tendency which seals, shot during summer and autumn, have to sink, is owing to the diminution of their fat as summer advances. Seals shot in spring do not sink, because they are much fatter then than at any other season of the year. It seems, then, that winter is the summer season of the seals. This is nothing more than one might expect, for during winter they never come up on the ice, and to avoid the cold at the surface of the water, they remain underneath as long as possible; the result of this is a languid condition of the respiratory functions, which, to a certain extent, entails the same condition in the other excretory functions. Their food is not less abundant, and the process of assimilation is equally active, and the only thing that seems to be wanting to complete the harmony of such a perfect combination of circumstances, is a reservoir for the surplus of highly carbonized material; and this, too, we find in the fat deposited immediately beneath the skin. The same circumstances are peculiar to all the amphibious mammalia in the

Arctic Seas. The wind continued during the whole afternoon, and as midnight approached, its fury had not abated. There was snow and rain, and dense blue and angry clouds drifting rapidly before the wind. Everything to constitute a complete storm was present, except the roaring waves, and they were kept more tranquil than we could have wished, for the sea was almost everywhere covered with ice.

September 7th.—As morning advanced the S.E. wind died away, and before noon it was a perfect calm. The weather was very thick, and occasionally there was rain, which changed the appearance of the ice around us. Our prospects of getting northward were very doubtful, for the ice in the channel was still holding on; and although in some parts it was considerably decayed, still we had fears it would weather out this season in its present position.

The loose ice moved off from the fixed ice, and returned to it again under the influence of the tide. It was wonderful to see a heavy floe moving northward against a smart breeze that came down the channel in the evening; however, this only continued for a short time, when the tide changed, and the whole pack was drifted to the southward by the combined agency of both wind and tide. It was fortunate that we managed to keep the ships at the fast ice, for had they once become fairly en-

tangled among the loose pack which was cemented firmly together by bay ice, I do not believe all our force could extricate them; and, as a matter of necessity, we would drift with it, not only out of the channel, but Barrow Straits and Lancaster Sound. There were spaces in the fixed ice where the action of the sun, through accumulations of water, had made distinct openings into the sea beneath, and some of them were sufficiently large to form docks for the ships. When a number of these spaces occurred in a line they frequently communicated, and in this way large sheets of ice became detached, and went away drifting before the wind. At one time, an extensive fissure was observed running about a quarter of a mile into the floe stretching across the channel, and, as we were on the lee side of this detached fragment, it was clear we must drift with it to leeward. Lines were instantly run out, and, by means of a small plank, the fissure was crossed, and our anchors were secured in the free edge of the ice which still remained fixed. It was hardly possible, however, to hold on with a floe a quarter of a mile in breadth across the ships' bows, and on this account the lines had to be slackened out, otherwise the increasing strain would soon have snapped them in two. This was a critical moment, and, as we were just expecting to have to slip, the drifting

floe split across at right angles with the fissure which at first detached it, and an opening occurred within a few yards of the ships, which permitted them to pass through, and haul up to their ice-anchors.

Towards evening, the wind down the channel increased, and began to drift large floes from the edge of the fixed ice into Barrow Straits. This was very encouraging, although it was hardly general from side to side of the channel. It commenced on the east side, and wrought a most effectual change in the course of a few hours. About six miles eastward, the free edge of the ice came to a point, whence it led away N. several miles, and then inclined westwardly, where a widening fissure was all that could be seen from the crow's nest. This was a sufficient indication that an extensive sheet was just about to be detached, and it was looked upon as one of the most favourable circumstances that could happen. The rudders, which had been in the slings across the ships' sterns for nearly two days, were shipped, and the ships were cast loose and all sail set. It was as much as they could do to carry the top-gallant sails. Our course was eastward until we reached the point of ice, after which we commenced plying northward, between a fringe of ice which still held on to the land on the east side of

the channel, and the ice which appeared to have left its original position in the middle of the channel but an hour or two previously. Cape Bowden could be seen quite plainly; and it was evident, to all in our Expedition, that a few hours of such a favourable wind as we then had would enable us to ply up abreast of it. The detached floe was soon weathered, and then the edge of the fixed ice was attained. The knowledge that there was open water beyond this barrier, and at no great distance, assisted the eyes of the commanders, who said that they saw it from the crow's nests. Captain Stewart told me that he saw it as plainly as ever he had seen water in his life. From this we had reason to believe that the barrier had been reduced to a breadth of twelve or fifteen miles, taking into account the assistance of refraction.

After reaching the fixed ice, we stood across along its edge to the westward, thinking an opening might be found in it leading northward. The breeze still continued to encourage our expectations that a disruption would happen, which might favour us in seeking up the channel. The sky was very clear, although there were a few clouds upon it, and the horizon all round appeared to dip beneath it without impediment from mist, or any condition of vapour to render vision obscure, or prognosticate anything but good weather.

The barometer was 30·38, having risen almost steadily for four or five days previously, and the temperature of the air was down to +23°, and that of the water 29½°.

September 8th. — After arriving at the west side of the channel, having examined the edge of the ice from side to side without finding any opening, and expecting that a second large floe would come out as the first did, we stood back again to the opposite side, which we reached in the morning, but found no opening, nor sign of one that might encourage hopes of getting through. The wind was beginning to fall, and clouds were spread over all the sky; the temperature of the air was +24°, and of the water 29°. In spite of the strength of the wind and the agitation of the water, which from the force of the wind was considerable, young ice formed on the surface of the water to a great extent, and assumed the well-known form of "pancake" ice, which the wind was continually drifting to leeward. The ship's bows were encrusted with ice, and the rigging of the bowsprit was fantastically fringed with pendant icicles, which appeared like so many rows of frightful teeth moving furiously over the surface of the water, and ready to seize any unfortunate thing that might come within reach of their horrid grasp.

As far as the shores of the Wellington Channel

had been examined by our Expedition, no creeks or inlets were discovered in them, into which ships could be drawn for shelter from the influence of the drifting ice. We knew of Barlow Inlet, but we had never seen it; however, an eye was kept to it, in case we should be forced to take shelter from the violent action of the drifting ice.

About noon we were again at the edge of the ice where it came in contact with the west side of the channel; and, in the course of the evening, Captain Penny went ashore, and examined a portion of the coast. He erected a cairn, placing a pole in its centre, and deposited a cylinder containing papers relative to the position of the ships, and their mission. The cairn is about twelve to fifteen miles north of Barlow Inlet.

The ice was close at Cape Hotham, where we could see, among the drifting pack, H. M. ships "Resolute" and "Pioneer." The American ships "Advance" and "Rescue" were lying in the entrance of Barlow Inlet, waiting an opening in the ice at Cape Hotham. There was no appearance of an early opening there, as Barrow Straits appeared to be full of ice; and a shift of the whole mass to S. E. would be necessary before a space would be left free at Cape Hotham. In the evening, after Mr. Penny returned from the land, the ships were allowed to fall

to leeward with the main-yards aback; but at times a short tack was made to recover the leeway. Their rudders became so encrusted with ice, that it was almost constant employment for one man with a boat-hook to break it away, to allow of that freedom of motion which is necessary in such an important part. The temperature of the air then was +22°, and of the water 28°. The barrier of ice in the channel did not appear the least disposed to shift its position, from the view Mr. Penny had of it from the hill-top where he erected the cairn. It was really difficult to know what course to pursue. The Wellington Channel seemed to persist in refusing entrance into the sea beyond it. The advanced period of the season rendered the position of sailing ships rather precarious, that of the steamers, however, much less so, for reasons which need not be repeated. It was becoming too clear that we would be forced to relinquish all our ideas of getting north; therefore, an attempt might be made to push westward. To have remained in the channel would be standing still, and it would also be exposing us to the inevitable risk of getting beset, which, for too obvious reasons, we could not be too sedulous in avoiding, if we did not wish to drift helplessly down the country.

September 9th.—The open water, on the north side of the barrier, in the channel was seen quite clearly,

although there was a misty haze, or a mixture of this with clouds, over all the sky during the whole of this day. We could entertain no hopes of getting into it, in consequence of the rapid formation of young ice, which took place when the wind failed towards midnight. The ice at Cape Hotham eased off to the eastward, and left a passage between it and that headland. The "Resolute" and "Pioneer" were still beset, and they were evidently drifting down Barrow Straits. Their position was unenviable in the highest degree; indeed, it is very doubtful whether we could have got clear with our sailing vessels, had we been similarly situated. The young ice among the pack must have acquired great firmness, and it seemed to offer great resistance to the steamer as she came against it. At length they began to move westward, and this was a pleasing and a sure sign that they were getting clear. From the movements of the "Pioneer" she appeared to be doing all the work, while the "Resolute" submitted to be towed passively behind her.

The ice was hourly becoming slacker at Cape Hotham, and in a few hours after breakfast we had the gratification of seeing that rugged promontory to the eastward of us, as we plied westward along the south shore of Cornwallis Island. There was open water to the extent of five miles along the coast, but

it was covered with young ice, which varied in thickness from the merest film up to an inch. The "Advance" and the "Rescue" were at first ahead of us, but they soon fell astern from their slowness of sailing. The "Resolute" and the "Pioneer" were steaming away ahead; but with the favourable breeze we had, and by choosing those parts of the water where the ice was weakest, we got on so well, that they never increased their distance in the advance of us, and sometimes I thought we were gaining upon them. To the westward of Cape Hotham, we observed a flag pole, and a "depôt," left by H. M. S. "Assistance" a day or two previously. In the afternoon the Americans were out of sight astern. The wind continued to blow from the westward, but about nine o'clock it moderated a little, so that we did not make such rapid progress among the young ice. Had it fallen calm, we should have stuck fast, and then we should have been in the same predicament as the two ships ahead of us were in in the morning — worse, indeed, because we did not possess the same means of helping ourselves.

September 10*th.*—About nine o'clock in the morning our progress westward was stopped by ice stretching across Barrow Straits from Griffith's Island. A few miles southward of this island, we found H. M. ships "Assistance" and "Intrepid" made

fast to the ice, and the "Resolute" and "Pioneer" were just running out their warps or moorings. In the evening the "Advance" and "Rescue" overtook us, and also moored to the same floe.

There was a heavy fall of snow during the day, and the sky was overcast with dense gloomy-looking clouds; there was, however, a smart breeze from the westward, and the temperature of the air ranged from +28° to +30°, that of the water being 28° or 29°.

In the evening the horizon cleared up, and, as our ships were moored two miles south of the other ships to the same floe, we could see Lowther Island, and occasionally the land on the south shore of Barrow Straits. There were lanes of water among the ice in all directions, except when the floes were of such great dimensions that we could not see their extreme limits. Some of them (especially the one to which the ships were moored) were very thick and heavy, and they contained pools of fresh water, over which there was a coating of ice two or three inches thick. These floes must have drifted into the position in which we found them. Their relations with one another, and with the ice generally, in other parts of Barrow Straits, seemed to convey no other idea than that they had never grown where they then were. The question then was, whence did they come, and

how long since? It is very probable that they had shifted from the far west, where, according to the description given by Captain Parry, the ice is generally very heavy. Immediately westward of these heavy floes, we could discern a very distinct water sky in the direction of Lowther Island, but it seemed very unlikely we should reach it this season.

Captain Austin and Mr. Penny endeavoured to arrange how the different Expeditions were to engage in the search, now that we had all "landed at the same spot." This was by no means an easy matter, for the state of the ice had to be taken into account, and they had often found how obnoxious it generally proved to all their best-laid schemes.

September 11th.—The wind came away very keenly from about S. E. at an early hour in the morning. The sky was still densely overcast, but the horizon was discernible to a considerable distance in a S.W. direction for a few hours after four o'clock in the morning. This gave way, however, for a heavy fall of soft snow, which continued during the whole day and night. At that hour the ships were cast loose; and, with all sail set, and a seven knot breeze, we stood off about S. E. for three hours, with the hope we should reach the south shore of the Strait in the vicinity of Cape Walker. Our hopes, however, were not realised, for the ice became quite close, and forced

us to retrace our course with all possible haste, lest the loose pack to S. E. should shut us in. At half-past ten or eleven o'clock we saw the Expeditions, through the thick snow, lying exactly where we had left them; and, still holding on for Cornwallis Island, we met the "Felix" between the latter and Griffiths' Island. The "Felix" willingly joined company, as we kept our course for the land, where we expected to find shelter from the violence of the storm, and from the ice, which would be drifted rapidly to the westward before such a strong breeze.

A "school" of walruses was seen 'twixt the two islands about the time we met the "Felix." They seemed to be a little curious to know what the ships were, and what such unusual objects could be seeking, for they followed us a little way; however, as we were going rather fast for their curiosity, we soon lost sight of them. There must have been at least a dozen of them together. It was amusing to see them raise their huge heads and fierce-looking tusks partially out of the water; and when they went out of sight, with a splash of their hind flippers, it seemed to be more from their sportive manner than from fear. When walruses are met in a drove like this, they do not take fright; and certainly they are formidable assailants, if their curiosity should lead them after some unfortunate Esquimaux in his kyak. Mr.

Petersen told me that a number of Esquimaux, making a passage in a large luggage boat between two islands, with a number of smaller islands intervening, were detained for several days by an immense herd of these animals. The Esquimaux landed on one of the islands, in the immediate neighbourhood of which there was another small island, on which a large number of walruses were always seen basking in the sun. As soon as the Esquimaux attempted to embark, the walruses took to the water and made towards them. It would be difficult to ascertain their motives; but it is most probable that mere curiosity was the chief cause, for there could be nothing in the boat that would benefit them in any way whatever. They might upset it in their gambols, and have the company of its terrified crew in their pastime; but that would be all; and it would hardly compensate such assiduous attention to the embarkation every time that it was attempted.

Mr. Petersen says that seals are sometimes attacked by the walrus, and that they not unfrequently fall victims to the caprice which it displays. A single hug between the fore flippers and the tusks will kill an ordinary seal; and a kyak has been known to be attacked and destroyed in a similar manner. The Esquimaux have observed this animal receive a piece of wood floating on the surface of the

water upon its fore flippers, where it was retained until it was broken by successive blows from the head and tusks.

Although seals, Esquimaux, canoes, and pieces of wood are indiscriminately attacked by the walrus, it is not probable that its food consists of any such materials. I never examined the stomach of one; but the whalers to whom I have spoken, and who have often seen them examined, say that fishes and shrimps composed the entire mass of the ingesta; and they deny ever having seen any traces of vegetable matter, such as sea-weed, among them.

After reaching the south shore of Cornwallis Island, we made several short tacks along it, with the hope of falling in with some place of shelter until the weather should clear up. There was constant snow; and, as it fell on the surface of the water, it did not melt, but remained on the surface, and drifted before the wind. We often had to pass through accumulations of this kind, in many parts a foot thick, which proved a great hindrance to the ships, and resembled a layer of soft lard. Towards evening the wind fell considerably, but still there was a gentle breeze, which gave the ships steering way, except where the snow on the water was so thick that one might almost stand upon it. At one time the "Sophia" stuck fast, while putting about close to

the land. A boat was lowered with the intention of running a line to the ledge of the hummocky ice that fringed the coast, but the utmost efforts of the boat's crew could not propel her through the water. The oars were used with assiduity, and they took a firm hold of the snow on the water, but they hardly ever started the boat; and, had it not been that we had the line at the ship, I believe it would have remained beset among the snow, after the ship had drifted to leeward before the wind. After drifting a quarter of a mile along the edge of the coast ice, we came to a point of it which projected a little beyond theedge proper, and, as the ship was carried close along it, one of the men dropped down and fixed the ice anchors; another followed with a warp or two, and, in a few minutes, the "Sophia's" bow was dividing this thick and viscid layer, as it passed westward with the advancing tide and the wind. In a short time a lane opened out in it, which enabled us to get to the offing, where we fell in with the "Lady Franklin" and the "Felix."

During the night there was very little wind, and no one knew its direction, for the compasses had long since ceased to be of any service; the sky was completely overcast, and the stars were shut out from our view. We were pretty sure of our distance from the land, and, if the loose pack should carry us close to it, there could be no danger, for the fringe

of ice along the coast extended at least two or three hundred yards from the beach; and, from soundings we had taken in the evening, we knew that there was water at it to a depth of fifteen fathoms. The only thing we had to fear in that quarter was pressure; and with respect to it our little vessels had been pretty well proved; and their obliquity, fore and aft, together with their buoyancy, had shown that, in the most violent pressure among ordinary surface ice, they would be quite safe. On the other hand, we had to fear getting beset, and in this respect we were already beginning to realise our worst anticipations, for a few hours of a low temperature would cement the snow on the water around us into an impenetrable floe, from which it would defy all our skill and energy to extricate the ships.

September 12th.—The first few hours of this day were passed with the ships' yards aback, as they were cruising about among the soft snow and fragments of pack ice. The snow fell very thick, and the decks were covered with it to a depth of several inches. As morning advanced the wind came away from about N.W., and dense white clouds began to rise on the horizon in that quarter, while the mist and gloom which pervaded the atmosphere elsewhere began to disappear. We had little idea of anything but that the ships would be carried before the wind among the drifting

ice and snow. An attempt was made, however, to get clear of it, and the "Sophia," as usual, showed her superior prowess in battling with the ice; but she was only second to the "Lady Franklin." Few, except those who have been eye-witnesses, can imagine the difficulty there is in getting out of a lee pack. It is necessary to carry hard, to convey sufficient impetus to overcome the resistance offered by the ice. When that resistance has to be overcome by a ship dead before the wind, the entire force of the latter is brought to bear upon it; but, when it has to be overcome at less than a right angle with the moving power, it will be plain enough that the power must be increased in proportion to the resistance and the direction. The consequence is, that a ship which has to "bore" through ice upon a wind must carry very hard, and be often in great danger of being upset. The "Sophia" leaned over so much, that the boats' keels, which were on a line with the middle of the bulwarks, were often dragging over the surface of the ice. Under such circumstances, it was almost impossible to stand upon the slippery decks; and many a hearty tumble did the sailors get upon the snow which covered them. After getting clear of the pack we shortened sail, for the gale was increasing violently, and we then plied up to Cornwallis Island, in the side of which a small bay was found,

which we entered about noon; and, after one or two short tacks, anchor was dropped for the first time since we left Aberdeen. There is a muddy bottom in the bay, and the depth varies from seven to eight fathoms where the ships lay, it being about fifteen in the middle of the entrance, whence it gradually lessens to the beach. We observed a small cairn in the east side of the bay, and from this we had no doubt it had been previously explored by H. M. ships "Assistance" and "Intrepid," or by parties from them.

The "Felix" behaved well in working clear of the pack in the morning, but the "Lady Franklin" had on several occasions to leave a leewardly wake for her to follow; and after getting clear of the ice, it was painful to see that she missed stays several times. This was owing to the position of the foremast, which appeared to rise out of the bow, instead of being a little behind it. She succeeded in gaining the harbour at four o'clock in the evening; and, after passing between the "Lady Franklin" and the land, dropped anchor in four or five fathoms water.

CHAP. XII.

ENTERING UPON THE ARCTIC WINTER.

Violent Gale. — Preparations for a Continuation of the Search. — Walruses and Seals upon the Ice. — Two Ships seen sailing Eastward. — Young Ice. — View from Prospect Hill. — Kate Austin Lake. — Frozen Soil. — Animals upon the Land. — Vegetation. — Assistance Bay. — Dredging. — Winter Quarters. — Difficulties of late Navigation. — Anticipations respecting Winter. — Health of the Crew. — Hard Water. — Excursions. — Captain Austin's Squadron. — Intense Thirst; eating Snow. — Pressure among young Ice. — Sea Salt in Ice. — Excursion. — Open Water off the Harbour. — Ducks still seen. — Excursion Inland. — Deep Ravines and River Bed. — Bridges of Snow. — Ships housed in. — Store Houses. — Esquimaux Dogs. — Tide Gauge.

THE wind continued to blow with increasing violence during the whole day and night, and hopes were entertained that we should be able to advance to the westward. This could only happen by the present wind opening out a passage on the south side of Griffith's Island, and in the direction of Lowther Island.

As soon as the crews had become a little refreshed the watch was set, for we had all hands out in the early part of the day, and the ships were cleared of an immense accumulation of snow about the decks,

and ice upon their sides down to the water lines; and preparations were made aloft for working them in violent gales. A boat was landed from the "Sophia," and another from the "Lady Franklin," at a low point on the west side of the bay, with the hope they might prove useful on our return from the westward, if we should succeed in advancing. The "Sophia," especially, was well rid of such an encumbrance as a large whale boat across her stern.

It was intended to make a "depôt" of provisions where the boats were landed; but, having already contributed to one at Beechy Island, this was considered unnecessary, it being hardly proper to make a depôt within such a short distance of the one laid down by the "Assistance" at Cape Hotham.

An anchor watch was set at night, as the ship was lying very securely, and the anchor seemed to be in good holding ground. The night was rather stormy and had a wintry aspect, while the blue sky and the stars could be seen towards the zenith, and the horizon was so much obscured by drifting clouds, that objects at a distance of three miles could not be discerned.

September 13*th.*—During the early part of the day the wind continued to blow with unabated violence, and the horizon was very obscure, but the sky was clear towards the zenith. In the entrance

of the harbour herds of walruses were seen moving about in the water, and occasionally one of them would go upon the ice; but the weather was too cold for them in that exposed state, so that they soon re-entered the water. The temperature of the air varied from +14 to +9, consequently it need not be wondered that, with their wet hides, they could not endure exposure for any length of time. Seals were seen occasionally in the bay, but they never ventured upon the ice. These animals are sometimes, though rarely, found frozen at their holes by the Esquimaux. Disease is probably the cause by which they are impelled to leave the water in the depth of winter. Mr. Petersen gave us little hope that walruses would be found in those seas during winter, for he says they all go south before winter fairly sets in. He believed small seals would remain over winter, as they keep breathing holes open in the ice. A few eider ducks with their young frequented the entrance of the bay, and they were often seen sitting upon the ice at the eastern and western extremities of it.

The crews were very busy taking down the royal-masts and putting up short top-gallant masts, and examining other parts of the running rigging, so that they might be in readiness to be used at a moment's warning. In the evening the wind moderated a little, but the sky became overcast with a blue misty

haze, which obscured the horizon so much that at a distance of a mile and a half objects could not be clearly discerned. There was some doubt whether we ought not to go out of the bay and try to push westward, but it was removed by exercising that caution which was necessary in such unsettled weather, accompanied by very low temperatures.

At six o'clock in the evening, two ships were seen running to the eastward, about a mile and a half, or at most two miles, from our ships. They could not be distinguished very clearly through the mist, consequently there was a difference of opinion with respect to what they were. Some supposed them to be H. M. ships "Assistance" and "Intrepid," proceeding to Beechy Island; while others, those who had first seen them, said they were schooner rigged vessels. It was certain they must have been the American Expedition or a detachment of Captain Austin's squadron. It was impossible to communicate with them by means of boats, without running risks of having to spend two or three days and nights in the pack with a boat, which would be by no means agreeable in such cold weather. We did not telegraph, because the weather was so thick that although we could see them, they could not see us in the face of the land, which in many parts was white with snow. In less than a

quarter of an hour from first seeing them we lost sight of them off the east point of the bay.

14*th.*—During the night and morning young ice formed extensively around the ships and in the offing, until it reached the loose pack, which was at a distance of five miles from the land. The "Felix" was completely frozen in, and men could be seen walking on the ice around her. The "Lady Franklin" and the "Sophia" were still in open water; but frequently there was a large accumulation of young ice around them. There was some difficulty in keeping up communication between our two ships on account of the young ice, for the boat many times stuck in it in spite of all that six oars could do to relieve her.

Captain Penny, Mr. Stewart, and others, went ashore, and ascended a hill which was called Prospect Hill. It is about four hundred feet high, and commands a tolerable view of Barrow Straits. The ice to the westward and southward of Griffith's Island was exactly as we had left it on the 11th, four days previously. From that island, southward to Capes Rennell and Walker, and eastward filling up Barrow Straits, except five miles along the south shore of Cornwallis Island, nothing could be seen but an impenetrable barrier of ice, in which there were some floes several miles in extent. I have already

remarked that there was open water along the south shore of Cornwallis Island. It commenced at the south point of Griffith's Island and extended eastward, until the south-eastern side of the bay took it out of sight. It was not open, however, in any part, for it was covered almost throughout its whole extent with young ice, which appeared to increase in thickness from the land to the pack. At the land there were a few narrow lanes among it; at the pack ice it presented one entire sheet. In such a formation of young ice our ships would do very little, unless with a leading wind. The prospects from Prospect Hill were exceedingly bad: to proceed westward was impossible; eastward into the Wellington Channel we might attempt, but with every chance of getting beset. With steamers we should have been less dependent upon the winds, and could have remained longer out of places of shelter; and at that moment, when we dared not venture out of the bay with our ships, a steamer was observed moving to the northward, close to the east side of Griffith's Island.

At the foot of Prospect Hill, on its north-eastern side, a lake was discovered, and named Kate Austin Lake, out of compliment to the gallant commander of the Expedition at that time in search of Sir John Franklin. It is about a mile in length, and a little more than a quarter of a mile

in breadth; its direction is about E. S. E. and W. N. W., and it is surrounded by hills rising gradually to a height of four or five hundred feet, except at its eastern extremity, where a small stream escapes from it into a river which enters the bay. The water in it deepens gradually from the edge to the centre, where it is about two fathoms. On the south side of the lake, and immediately at the foot of Prospect Hill, there is an elevation of rough rocks jutting out into it, causing a contraction in the middle, which adds very much to its beauties. This is called Rocky Point, and, upon a close visit, the abundance of orange red lichens which variegate the rough rocks on which they grow gives it a picturesque appearance. After descending to the lake, we found it covered with ice to a thickness of six or eight inches; and through this ice, which was quite transparent, we could see small fishes darting about, apparently frightened by the noise of our feet upon the ice above them.

Our return to the ships in the bay was along the bed of a river; and from the size and other features which the stones in it presented, we had every reason to believe, that there must have been very large runs of water in it at some time previously, although it was quite dry at present. The soil was frozen hard everywhere, although from the fact that there

was so little ice on the lake we had just left, we might infer that it had not penetrated to a great depth. It is difficult to ascertain the exact depth to which it becomes thawed during the summer months; there is no doubt it must vary according to the exposure and the declivity. In southerly exposed parts there may be a depth of several feet of the thawed soil; whereas, when the exposure is northerly, it may not be as many inches. Where the mean temperature throughout the year is so far below the freezing point of water, the soil must also be cooled down to a depth far below the surface, before the heat from the interior of the earth can overcome the cold which is conducted from the atmosphere. The depth beneath the surface at which the temperature is kept at the freezing point of water by the heat of the earth, will never vary; for it is beyond the immediate influence of heat and cold, during summer and winter. It will be uninfluenced by conditions of the seasons and by all external circumstances, except elevation above the sea level and latitude. There is a point, however, where it will vary, when the action of the sun is sufficiently intense to penetrate the thin crust of ice that forms during winter; and it will probably be found where the mean temperature throughout the year is about the freezing point of water.

On some parts of the land there were accumulations of snow, which had recently fallen. We frequently observed patches of it thickly marked by tracks of lemmings and snow-buntings; and also, although rarely, by tracks of hares and foxes. Some of the lemmings and the snow-buntings were seen; the former escaped by getting into their burrows in the shingle. The snow in some parts appeared to have been scratched up, as if they had been removing it for the sake of the vegetation that might be found underneath. It was rather strange to observe the smooth surface thus broken over a tuft of the purple saxifrage, where there had been at least half an inch of snow above the plant. What instinct could have led the creature to single out the exact spot on which to bestow its toil? Was it by the sense of smell, or merely by detecting some arrangement of the surface, which marked the presence of its food underneath? I think it very probable that it was the latter; for in some parts the scratching appeared to have been in vain. There is no doubt that all herbivorous animals that may have to pass their winters in high latitudes, follow this practice of pawing the snow from the almost bare surface, in search of their food, which it conceals. The musk-ox, the deer, the hare, and the lemming, are the only animals belonging to this great order which inhabit the North Georgian Islands;

and although it is doubtful whether they all pass their winters in these high latitudes, it cannot be denied that there is provision for the largest of them as well as for the smallest. In proof of the burrowing propensity of animals not herbivorous, Sir John Ross relates that he shot a hare in autumn, during a violent snow storm, which buried it out of sight, and prevented him finding it. In the following spring two ravens (being the first birds to migrate northward in spring) were observed digging incessantly among the snow; and recollecting the circumstance of having lost some game thereabouts in autumn, he repaired to the spot, and arrived just in time to pick up his hare, for which the ravens had excavated through a depth of twelve feet of firm snow! It was frozen quite hard, and, of course, proved to be as fresh and wholesome as if it had been shot but two hours previously.

Vegetation appeared to be rather scanty, and every plant was quite dry and withered-like with the frost. From the circumstance of the frost setting in suddenly, the juices and nutritious products of plants must be arrested, in the changes they undergo in the process of ripening (a state which they hardly ever attain), and in this state they remain until the thaw of the following summer calls them into active circulation. In the early part of this narrative, it has been

observed that the crowberry (*Empetrum nigrum*), so abundant in West Greenland, although unknown on Cornwallis Island, has been found in immense numbers in the middle of May, possessing all their nutritious elements, and their juices sweet and unchanged. Although probably seven or eight months had elapsed since they had come to that stage of development, having remained the whole of the time frozen beneath the snow, their nutritious elements seemed not to have suffered in the slightest degree by being frozen. After being thawed, however, they soon lose all taste, and having collapsed, the skin ruptures and the seeds escape into the soil, to spring up, if they are not devoured by the little snow-bunting or the redpole. In this way Nature lays up stores for the winter use of those creatures which have to pass their whole lives in the inclement regions of the far North; and in doing so, she vies with the busy farmer, who cuts his grass while it is still green, and makes his hay under the bright sunshine of summer.

At an elevation of from twenty to thirty feet above the level of the sea, and at a distance of a quarter to half a mile from the high water mark, right round the bay, there were a great number of small lakes, varying in depth from one to four or five feet, and on which there was ice to a thickness of seven or eight

inches. On the S. E. side of the bay, a little above the beach, we found the cairn which had been built by some of the officers of H. M. ships "Assistance" or "Intrepid," which ships had passed westward to Griffith's Island a few days before us. In consequence of her priority of discovery, we considered that she was entitled to have her name perpetuated. Accordingly, it was called Assistance Bay. It is entered by three streams, the largest of which descends from a chain of small lakes, on the other side of the hills, rising at the western extremity of Kate Austin Lake. The smallest escapes from a number of small lakes on the east side of the bay; and its whole length is not above two miles. Between these two streams, which are, when they enter the bay, about a mile apart, there is a third, to which allusion has been made already. It descends from the interior of the island, taking its source about ten miles inland; and after passing within three hundred yards of the eastern extremity of Kate Austin Lake, it winds past the foot of Prospect Hill, and then enters the bay. Assistance Bay is an estuary, through which the melting snow on a great portion of Cornwallis Island makes its exit into the sea; and hence the muddy bottom which was discovered when the anchors were dropped. After going on board, the dredge was put down; in spite

of the young ice, there were small openings caused by the tide, which enabled the boat to tow the dredge backwards and forwards. The depth varied from seven to ten fathoms; and the bottom was everywhere muddy, without any stones.

It was very cold indeed, to work with the bare hands among mud and slime, when the temperature of the air was $+15°$ to $+19°$; but it was more than amply repaid by the varieties of animals, and the beauties of plants, that came up from their muddy habitats. „ The Whiting, Gurnard, Bull-head, and the Sucking-fish of the British coasts, had their representatives. But the greatest abundance of animal life was among the Mollusca; next to them the Radiata; and last, although also very abundant, Crustacea. Although most of these may have been known previously, it was not unimportant to be able to extend their geographical range. There were also Algæ, both palmated and filamentous; and among the mud, with a magnifying power of 250 or 280 diameters, one could detect thousands of infusoria, which moved by cilia, and siliceous diatomaceous forms, probably naviculi. I believe a whole volume might be written on a single haul of the dredge. Next to the brittle star fishes among the radiata, the *Holothuria*, or sea slug, was the most abundant. Among the bivalve molluscs, one could see the living

animal of shells found in tertiary deposits over the whole extent of the island, and at every elevation, from the beach up to four or five hundred feet. From side to side of the bay, and along the coast east and west of it, there are flights of raised beaches, which impress the idea that the whole coast has been rising from beneath the ocean. Besides beaches, there were mounds, such as heavy masses of grounding ice would have produced in loose shingle at the bottom, a little below the water mark.

16*th.*—The ice in Assistance Bay was daily increasing in strength, and the "Lady Franklin" was in great measure frozen in, but the "Sophia" was still free to a certain extent, and could be extricated from the ice in a very short time. The "Lady Franklin," too, would soon be set free, if we saw any chances of advancing to the westward. The weather was generally very stormy, and there was hardly an hour during a whole day which would afford a passing glance at the ice in the Straits.

The water between the pack and the south shore of Cornwallis, leading in the direction of Griffith's Island, was considerably less than it had been since we came to the westward of Cape Hotham. This was owing to a strong S. W. wind, which prevailed for a day or two, and drifted the loose pack to the north shore of the Strait. Wherever open water

could be seen, there was on its surface a firm coating of young ice, which would offer powerful resistance to the ships. It seemed to be so strong that a four knot breeze would not carry our vessels through it. And it would do the same to the steamers, although not nearly to the same extent as to the sailing vessels. It was very uncertain where the other expeditions were, although on the 14th a steamer was supposed to have been seen proceeding northward along the east side of Griffith's Island. We were almost convinced of one thing, that they had not been able to get to the westward of that island, by going round its southern extremity; and to have passed up between it and Cornwallis Island would be found equally impossible. On the 11th, when we came in from the middle of Barrow Straits, we found one floe extending from side to side of the space between those two islands.

The question of going out of harbour (for Assistance Bay we feared would be our winter quarters), was receiving great attention, but the weather was always becoming more and more discouraging. In calm weather we dared not venture out, and when there was wind it was accompanied by drifting snow, which completely obscured the horizon, although the clear blue sky could be seen quite distinctly from the zenith to an altitude of 30° above the horizon. From the surface of open water, evaporation was continu-

ally going on, and the exhalation became condensed a little above the surface, from the low temperature of the air. A film of young ice might for a time come over the surface of the water, and so far prevent evaporation; but the tide or the wind was continually shifting the loose pack from place to place, and this invariably resulted in the destruction of the young ice.

It was much to be regretted that all these circumstances should oppose our operations, at a period when Arctic navigation could only be conducted. Late in the season, when young ice and violent weather force the most intrepid to seek shelter, the passages open out, and the ice in them leaves the shore, to which it had held fast during the whole summer, when work would have been an amusement, and it drifts about until it becomes again fixed at a distance of perhaps one hundred miles from where it had started. It was not without reluctance that submission was yielded to the ice, that was beginning to defy our exertions to continue the search for the missing ships. It was painful to reflect upon how little had been accomplished by the best endeavours of so many ships and willing crews; and that reflection was rendered still more painful when one associated with it the possibility that some of the survivors of that unfortunate expedition might at that moment be looking

and waiting anxiously for the help that would have been gladly hailed two years before. With what different feelings did we and they look forward to the winter! Surrounded with comforts we had nothing to fear. It could not be so with them, however, for one thing after another would have failed, and their slender stores of almost every article essential to comfort would be so exhausted, that, even surrounded by ample resources, they could hardly look forward to an agreeable winter. It was consoling to know that men soon become accommodated to circumstances, and that their dispositions, as well as their bodies, assume, within due limits, the shape of the mould in which they are placed. The length of time that had elapsed was more than enough to inure the survivors to the climate and to the circumstances which they had so long endured; and knowing also the never-failing resources of British seamen, and the readiness and ingenuity with which one thing is made to supply the place of another, we had hopes that even the sixth winter might pass over with safety, and that our efforts to find them, by means of travelling parties in the spring, would be crowned with success.

September 17th.—With the exception of one of the crew of the "Sophia" who had to be exempted for a few days from duty while suffering from *furunculus*, there had not been a single instance of disease or ill-

health in our expedition. It was discovered by mere accident that of one the crew, also of the "Sophia," had a small portion of the first bone of his middle finger in a diseased state. It never proved in the least annoying to him, nor did it in any way interfere with his duties, and it never required surgical interference except to remove minute spicula of bone as they became detached by exfoliation. So long as it remained quiet, and did not interfere with the man's duties, nor affect his general health, it might be safely let alone, and it would be sufficient to take active measures for its removal when the motions of a joint became affected by it. I thought it very probable, also, that a spontaneous cure might take place after exfoliation, and that it would heal up with little or no loss of substance.

Looking forward to the Arctic winter, and having before us the experience of others, we could not have any doubt as to the proper course to pursue to maintain health and harmony among the crews. The exaction of a certain amount of duty to be discharged daily by each person was indispensable, but it was resolved it should be done in such a manner as would make one and all feel quite at home in their winter quarters. Exercise in the open air, always so essential to health of body and mind, would require to be taken when the weather might be suitable, and in

violent weather, when we should find it impossible to be exposed with impunity, a diminished bill of fare would be a compensation.

The lakes a few hundred yards beyond the beach, about half a mile from the ships, were likely to furnish us with water for some time, and after they became frozen to the bottom, the ice in them could be taken to the ships, as being preferable to snow for furnishing a supply of water. The labour of taking off the ice would prove a source of exercise which could not be dispensed with, and it would continue throughout the whole year, until water should again appear in the lakes. The water was found to be very hard, and very ill adapted for washing. This was what one might expect in a district where limestone prevails. By mere chance, however, it was discovered that it was only the water which had been brought fluid from the lakes that possessed this property of hardness, while that obtained by dissolving the ice which formed on its surface was quite soft, readily yielding a lather with soap, and suited in every respect for domestic purposes. This afforded a proof, which no one could doubt, of the fact, that the process of congelation precipitates the earthy or saline matter which water contains.

A party was sent out in the direction of Cape Martyr, which we believed to be twelve or fourteen

miles westward. The object of the party was to ascertain, if possible, the position of the expeditions we had left in that quarter on the 11th. After they had proceeded about six miles from the ships, they all returned except two persons, and arrived at the ships at four o'clock in the evening, without having seen anything of the other ships. The two who did not return with the main body of the party, went on four miles farther, until they reached a hill on the east side of a bay, on the opposite side of which Cape Martyr could be seen very plainly, and answering the description given of it by Captain Parry, when he discovered it in 1819. From the top of the hill they saw four ships lying within one to two miles of Griffith's Island, moored to a floe which extended from that island across to Cornwallis Island, which it joined a little to the eastward of Cape Martyr. The western and northern limits of the floe could not be seen, but it was considered probable it extended westward to the extreme limits of Griffith's Island. The ships were clearly discerned to be no other than Captain Austin's entire squadron. There was a little doubt, however, with respect to two of the ships which were next to Griffith's Island; one of the party was quite satisfied that he had seen the two steamers and the two ships, while the other person was less certain. It was eight o'clock in the evening before they returned,

and then they were very much fatigued, having suffered a great deal from thirst, which they endeavoured to quench by eating snow. They were in a state of torpor, which resembled intoxication in a slight degree, and in that respect what had been observed under similar circumstances at Melville Island by Captain Parry, was acted over to the very letter.

The use of snow when persons are thirsty, does not by any means allay their insatiable desire for water; on the contrary, it appears to be increased in proportion to the quantity used, and the frequency with which it is put into the mouth. For example, a person walking along feels intensely thirsty, and he looks to his feet with coveting eyes, but his good sense and firm resolutions are not to be overcome so easily, and he withdraws the open hand that was to grasp the delicious morsel, and convey it into his parching mouth; he has several miles of a journey to accomplish, and his thirst is every moment increasing; he is perspiring profusely, and feels quite hot and oppressed; at length his good resolutions stagger, and he partakes of the smallest particle, which produces a most exhilarating effect; in less than ten minutes he tastes again and again, always increasing the quantity, and in half an hour he has a gum-stick of condensed snow, which he masticates

with avidity, and replaces with assiduity the moment that it has melted away: but his thirst is not allayed in the slightest degree; he is as hot as ever, and still perspires; his mouth is in flames, and he is driven to the necessity of quenching them with snow, which adds fuel to the fire; the melting snow ceases to please the palate, and it feels like red-hot coals, which, like a fire-eater, he shifts about with his tongue, and swallows without the addition of saliva; he is in despair, but habit has taken the place of his reasoning faculties, and he moves on with languid steps, lamenting the severe fate which forces him to persist in a practice which in an unguarded moment he allowed to begin.

September 18th.—Captain Penny went out in the direction of Cape Martyr, to observe more correctly the position of the squadron at Griffith's Island. The sky was always overcast with clouds or a misty haze, which greatly obscured vision, and it was rare indeed to get a correct view of the horizon. At noon it was much clearer than usual, and this enabled Captain Penny and his party to get a better view of Barrow Straits than we had for a few days previously. The whole of it appeared to be full of loose pack ice, which had small spaces of open water, covered with young ice, among it.

There was a space along Cornwallis Island, and

extending to the westward as far as the south point of Griffith's Island, in which there was very little ice except a young formation, and it seemed to be entirely deficient in no part; but it varied much in thickness, in some parts only a mere film, in others two or three inches without overlapping, and where this was present, it might be six or seven feet. The ships were just where yesterday's party had described; they were beset very closely among young ice at the edge of the old ice, which still retained its position between the two islands. In the afternoon the sky again became overcast, and a fall of snow commenced.

When young ice is brought together by pressure, and raised into heaps, which are sometimes one or two feet above the surface of the water, and twelve or fourteen feet underneath it, it does not maintain this enormous thickness throughout the winter, but is diminished from the under surface until it is of the same thickness with the ice against which it has been pressed up. This can be easily understood, from the circumstance that it is formed at a lower temperature on the surface of the water than that to which it becomes exposed after being thrust twelve or fourteen feet beneath. And there can be no danger of confounding it with the different condition of icebergs, which form at a temperature of $+32°$, and

remain solid until the temperature of the medium in which they move, or are seen, is raised above +32°. If one piece of sea-water ice, formed at a time when the temperature of the air was +20°, and another piece of the same size, also sea-water, but formed at a temperature of +30°, be submerged in the sea at a temperature of +30°, nothing can be plainer than that +20° will dissolve, and +30° will remain solid; and the same thing would obtain, suppose there were but a difference of 1° instead of 10°, although it would be less marked. It is owing to the different proportions of salt which each contains.

September 19th. — The weather still continued very unsettled, and we frequently had drifting snow and violent squalls sweeping down the rugged ravines around Assistance Bay. The snow fell so thick, that many times intended excursions into the interior of the island were put off. Although it was not safe to leave the ships to any distance, there were frequent shooting excursions, which occasionally yielded a hare or a few ptarmigan, and no person ever lost his way. The situation of the bay, the point of meeting, as it were, of three rivers, made travelling on the land, even in snowy weather, comparatively safe. On losing his way, one had nothing to do but cross the land until he found a ravine,

which he could follow downwards to its termination, and then he would find the coast, or the bed of a river, which would lead him to the ships.

Captain Stewart and another person went to observe the position of the squadron at Griffith's Island. They travelled out ten miles, and then they were at the hill opposite Cape Martyr. The ships appeared to have shifted their position a little, for the ice in Barrow Straits had drifted southward before a northerly wind, and left them in open water. One of them appeared to have some of the loose pack still about her; but it was hardly discernible at the distance from which they were observed. The floe to which they were moored was still holding on; but open water could be seen at the N. W. side of it, extending across from the one island to the other. From this it was doubtful whether it would continue to hold out against the strong northerly winds, and that made it appear probable that the Expedition would shift its position as soon as possible.

September 23*rd.* — Assistance Bay was now covered with one continuous sheet of ice from the east to the west point, but beyond them there was open water, except when a southerly wind brought the ice in Barrow Straits against the land. In still weather young ice would form on this water, but it was never permitted to shut it completely in; the loose

ice invariably moved about sufficiently with the tide to destroy the young ice, and prevent a continuous surface. There were still a few ducks in the water, and sometimes we had some sport shooting them. They would have taken their departure for the south long before now, had their young been able to accomplish the journey. None of those birds had been observed for a week or ten days, except where there were young ones which could hardly fly. The ducks, unlike the seals, came upon the ice, and not unfrequently alighted on it at a distance from the edge next the water, for the purpose of attracting their young out of the water, to teach them the use of their wings. Some of the poor young things were caught by chasing them on the ice, while their affectionate mothers hovered over the heads of those who so mercilessly attacked their helpless offspring. The walruses, which had been so numerous when we entered the harbour, had all disappeared, and we had little expectations of seeing them again until the return of summer. Some, however, might still have been in the open water, although they never came upon the ice.

The crews were busily employed fitting the roofing clothes, which had been made before leaving England, but did not fit very well, owing to some mistake in the cutting, about the two ends, fore and aft. By a

little alteration they were found to suit much better, and in a few days we hoped they would be ready to cover our decks in like awnings, which would keep out every particle of snow, and enable us to take exercise beneath them during violent storms.

Assistance Bay was beginning to show signs of life and activity. On this point a party of strollers; on that level plain two boon companions with their guns; wending his way in a rugged ravine, charmed with its iron cascades, and wretchedly dreary, wild, and barren aspect, a solitary individual; and, chasing one another playfully along the beach, the dogs, were the objects that now began to meet and please the eye.

Mr. Stewart and I took a walk with our guns directly inland. Our course lay along the borders of the middle stream which enters the harbour, and we followed it seven miles. The interest of our journey lay in the deep cut which the water of the stream had made in the solid rocks. For the first four miles the bed of the river is composed of fragments of rock which have been made smooth by attrition; but there are also fragments with sharp corners and rough faces, and they vary in size and weight, from half an ounce up to half a ton; the nearer the harbour, generally, the smaller and smoother they are. Beyond the third or fourth mile, it frequently presents

the horizontal strata of secondary limestone, of which the island is chiefly, if not entirely, composed; and from this the two sides rise rapidly, and sometimes perpendicularly, to a height of one hundred and fifty or two hundred feet, and form a horrid chasm. In some parts there are distinct echoes, which one can hardly enjoy, for fear of bringing about his ears some of the loose rocks from the overhanging cliffs. In other parts again, and very frequently, bridges of firm snow extend along the chasm for two or three hundred yards, and present a depth of forty feet over the arches, which rarely exceed twice the height of a man, and vary in breadth, sometimes occupying the whole bed of the river. Those bridges proved effectual in damming up the water for a time, and in some instances only allowed it to escape gradually, but in others with tremendous velocity, carrying huge masses of rock before it, and demolishing all the bridges between it and the sea.

At one part there was a ledge of rock stretching across the bed of the river, which had been undermined to a depth of five or six feet beneath its inferior edge, and over this the roaring cataract had to hurl, with its burden of ice and snow, two months previously; but now it was quite dry, and a cascade of ice, the result of the last drainings of the stream,

marked the character and power of the *genus loci.*

September 30th.—We began to feel by this time that winter was truly setting in, and that it was necessary to keep pace with it by endeavouring to advance with our preparations. The awnings were fairly secured in their places, but they were still subject to be traced up at the sides in fine weather. A store-house for our provisions was building on the shore, with as much expedition as the weather and the accumulations of snow permitted. Strong gales with drifting snow were very common, and although the weather at times appeared to be misty, it was frequently observed that the mist was chiefly confined to a very low stratum, while the clear blue sky could be discerned towards the zenith.

The snow, which accumulated into wreaths during northerly winds, became consolidated in a short time, and could be made into ashlar work of great nicety and beauty. The walls and roof of our store-houses were built of square blocks and slabs cut out of the wreaths which accumulated during the northerly gales. Those with southerly gales were not nearly so firm, and they never were permanent, for the first strong northerly wind removed them. The temperature was decreasing rapidly, and many times, during clear weather and a keen wind from the north, those

of us who had the greatest pretensions to hardiness acknowledged that the cold was intense; frost-bites of hands and faces were very common, but friction of the warm hand soon restored the circulation, and there never were any bad results, except the loss of a patch of skin, which a few days replaced. Foxes were seen frequently, and the traps which Mr. Petersen built on the land were fortunate enough to imprison one occasionally. Some of them were let loose with collars bearing inscriptions relative to the position of the ships and Expeditions, &c., and others fell into the jaws of the voracious dogs.

The dogs had increased very much in number since we got them, on the 5th of June, at Uppernavik. There were four females among them, and each had a litter of from five to eight; including young and old, we had about fifteen in each ship. The young ones were a month old, and as they ran about upon the ice around the ships, those of one female mixed with those of another; this always resulted in the death of some of them, and the seamen who had the charge of them, had often to lament that some promising little cur had been destroyed by some of the old males or females.

The old male Esquimaux dog, when hard pressed with hunger, will devour the young of its species; this, however, was not the cause of the deaths which

had happened with us among the latter. The young dogs themselves frequently fought with great spirit, and their sharp teeth left deep marks in their bleeding ears. The mothers separated them very affectionately if they all belonged to her; but if not, the intruders were severely bitten and often killed by her, from the fear she had for her own.

A tide gauge was prepared and set a-going on board the "Sophia," under the superintendence of Mr. Manson, chief mate, and orders were received it should be registered at least every hour. It would have been very desirable to register it every half hour, but, with our small crew, that was more than could be accomplished without increasing their labours during winter more than would be safe for their health. The arrangement was a line securely anchored at the bottom, ascending perpendicularly, through a hole which had to be kept open in the floe, up to the projecting end of the trisail boom, which, from being the ridge of the awning, was eight feet from the quarter-deck, and thence forward and down to the deck by means of two easy-going pulleys. To this descending part a weight lighter than that at the bottom was attached, and as the ship rose and fell with the ice which surrounded her, thus responding freely to the advancing or receding tide, so did the weight against a graduated scale, which could be read

off to half an inch. The meteorological register, which had been kept almost since we left England, was continued to be kept three-hourly. It would have been desirable also to have had the temperature of the air entered every hour; but, for the reasons already mentioned, this, too, was found to be more than our ship's company could accomplish with safety. The tide-guage was beneath the awning; this was a great comfort with coarse weather, since it could be read off, in the depth of winter, by the assistance of the deck-light. It was necessary, however, to go into the open air, to clear the hole in the floe through which the line passed; and this was all the more urgent in very cold weather, because then the coating of ice in it was so thick as to derange the indications of the weight against the scale. This opening was called the "fire-hole," from the circumstance that water from it would be useful in the event of fire breaking out on board the ship.

CHAP. XIII.

COMMENCEMENT OF THE ARCTIC WINTER.

Foot-prints of a Bear. — Short Excursion. — Squadron at Griffith's Island. — Hummocky Ice. — Boulders raised to the Surface. — Direction of the Tide. — Clothing served out. — Temperature below Zero. — Attempts to reach Griffith's Island. — Party from Captain Austin's Squadron. — American Expedition gone Home. — Wintering in the Pack. — Object of the Party. — Parties to Cape Martyr and Cape Hotham. — Frost-Bites. — Fatigue and intense Thirst. — A Party absent. — Severe Frost-Bite. — Violent Weather. — Pigeons sent off with Balloons. — Return of the Party to Griffith's Island. — The Cause of the intense Thirst. — Rockets. — Storehouse finished. — Preserved Pickles, &c. — Banking up the Ships. — Scale of Victualling. — Hunting Parties. — Fox with a Collar. — Party to Griffith's Island. — Return of the Party. — More settled Weather. — Fishing on Kate Austin Lake. — Scurvy on board the "Felix." — Preserved Potatoes. — Carrots. — Measures taken to remove Scurvy. — Thickness of the Ice.

October 2nd. — Mr. Goodsir and I were sent in the direction of Cape Martyr, to observe the position of Captain Austin's squadron. As we proceeded over the soft snow that had fallen but very recently, during a south-westerly wind, we observed recent foot-prints of a huge bear, leading to the westward close along the land. They sometimes appeared to lead out to seaward, and again inland to

the top of an eminence whence a short view could be obtained. In descending those eminences, the foot-marks were altogether absent, but in their room we found one continuous broad mark, which bruin left when he sluggishly threw himself upon his side, and slipped down the declivity upon the snow. It is very likely we should have had a visit from the bear at the ships, had it not been for the dogs, for which its species has no particular attachment. The slightest bark or howl among them would prove quite sufficient to warn him of the danger attending a nocturnal round in Assistance Bay. This was much to be regretted on account of the want of animal food for the use of the young dogs, which we fully expected would be fit for spring and summer travelling. After going westward about seven miles we returned, having seen the squadron at Griffith's Island, and satisfied ourselves that the ships had not shifted their positions relative to one another or to the land. They appeared to be still more closely beset than when they were last seen by Captain Stewart and another person, who accompanied him on the 19th of September.

The ice along the beach was exceedingly rough, and every day seemed to be increasing this condition in a remarkable manner. This was altogether owing to the bottom, which is rendered very irregular by

the action of grounding ice. Towards the close of the season the fringe of ice, which, till then, may have remained close along the land, drifts away and leaves the beach all along the coast exposed to the action of drifting ice, which often comes in with great force and takes the ground. The pressure continues, and whole piles of ice are raised up to a considerable height. This, however, will depend upon the "fetch" which the moving pack may have. The bottom, composed of loose shingle or mud, is raised into a number of irregularities, which are not confined to the high or low water marks, but extend to a considerable distance farther out than the latter. This is owing to the heavy ice taking the ground in deep water, while the light ice is carried to the high water mark, where it, too, marks the beach, although feebly, compared with the other. These moraines, as they may be called, remain after the ice which raised them drifts away, and they may vary in height from less than one up to three or four feet. When the whole surface of the water close along the coast becomes covered over with young ice, which rises and falls with the advancing and receding tides, the effect of so many elevations at the bottom will be to throw the ice into a very confused state; each heap at low water presents a circular arrangement of upright fragments of ice, and, when the tide returns,

they are hardly ever lowered to the level of the otherwise smooth floe; in their upright position they rest upon the edge of the heap, and resemble a crater, in the centre of which, but far below its surface, the gravel can be seen; and, by the continued rise and fall of the tide, a hinge-like action is kept up, which invariably raises accumulations of gravel, sand, animal remains, plants (seaweed), and living animals, and also huge masses of rock in the form of boulders or angular fragments, which all become imbedded in the substance of the ice, where they remain until they are set free the following season by the dissolution of the ice. These accumulations are met with in the ice throughout its whole thickness, until it begins to lose the hinge action on the bottom, after which there is little more than the blue ice itself. The ice which the tide leaves dry in this manner becomes exposed to the air; consequently, its temperature is lowered to that of the air, and, when the water returns, congelation goes on very rapidly; the water also escapes to the surface at the junction of the upright fragments with the ice around them, and adds to the thickness considerably, by undergoing early congelation. Drifting snow is invariably detained in enormous quantities where the ice is disturbed in this manner; and, before the end of winter, the craters will be all obliterated, and a series of rounded

elevations and wreaths of snow, some of which may be twelve to twenty feet deep, will mark the coast for many miles, where the bottom is not quite level. Some of the most regularly shaped of those crater-like eminences presented a magnified resemblance of the blisters which appear in mortar upon a wall, when the lime has not been sufficiently slacked before using. When we approached close to them, the rushing of the water attracted attention, and, on closer observation, we discovered that its direction was westward; on our return to the ships, Mr. Manson was able to satisfy us that the tide was rising, when we observed its westward current; and from this we could safely infer that the flood tide goes in that direction.

A whole suit of clothes was served out to the crews of the two ships, from the sealskin cap and mittens down to the stockings, boot-hose, and sea-boots. The provision that had been made for our Expedition in this respect was most ample; and the Admiralty, by whose orders the articles had been munificently supplied, as well as their respective makers, were equally entitled to our fondest remembrance and warmest gratitude. In this we had an unexceptionable proof of the care which the government of Great Britain has for all who may have the good fortune to be engaged in its services, and a feeling

was aroused, in the breast of every one, that we should not be deficient in the faithful discharge of the duties which so fond a parent had sent us to perform. On the part of the men, there seemed to be a desire to render implicit obedience to the orders of their officers, and the latter endeavoured to be as merciful as possible in their exactions, and to behave with the utmost courtesy towards those who were under them.

During the fore-part of the day the sky was overcast, and there was a slight fall of soft snow; the wind was from S. E., and the temperature ranged about $+12°$. In the evening the sky cleared up, and the stars looked out, the wind freshened up from the N. E., and at ten P. M. the temperature was down to $-\frac{1}{2}°$, but before midnight it was up to $+7°$, owing to the sky becoming again overcast, which prevented radiation of heat from the earth's surface. The temperature frequently varied in this manner; and we often found that, even at a late hour in the evening, when the sun was below the horizon, the indications of the thermometer were higher if the atmosphere were thick with clouds, than at noon, if the sky were clear and cloudless.

October 3*rd.*—The weather was clear along the horizon, and objects were plainly visible at the most distant parts of it, although the sky was a little overcast, and heavy clouds were dispersed over the whole

atmosphere. There was a light breeze from about N., and the temperature ranged from $+10°$ to $-2°$ during the whole day.

Mr. Penny and Mr. Petersen had on several occasions made attempts to drive over with the dog-sledge to Captain Austin's squadron; but, owing to the roughness of the ice along the land, which afforded the only passage in that direction, and the loaded and thick state of the atmosphere, they never succeeded in accomplishing their object. They started again at ten A. M., and were out of sight in a short time, off the west point of the harbour. In four hours they returned, accompanied by a party from H. M. S. "Assistance," of three men and two officers, the latter being Lieut. Mecham, and Mr. Ede, assistant surgeon, who were on their way to Barlow Inlet, to see if our ships, or the American ships, had found shelter in it. We now learned for the first time that the American Expedition had left this quarter, to return to America without delay; and, as may be readily supposed, we consulted our three-hourly registers of the winds and weather, since the 13th of September, the day on which they were seen passing Assistance Bay at six P. M. The result of this examination of the winds and weather was a difference of opinion, whether they had got clear of the ice, and into the entrance of Sir James Lancaster's Sound.

There were among us persons who were quite sanguine of their safety, and who believed that they had got clear; there were others, however, who were not sanguine, but low-spirited, and doubted very much the probability that they were safe or clear of the ice. We regretted very much that so much danger as we thought should involve the expedition which the philanthropy of America had sent out to the aid of Sir J. Franklin. It appeared strange to us that they could have made up their minds so suddenly to take such an important step, as we always understood, by report, that they were provisioned for three years. When they passed Assistance Bay, there was a six knot breeze, which, at nine P. M., three hours later, was down to four. It was from W. N. W., and would carry them to Cape Hotham. At midnight there was but very little wind, and it was from N.; the number one would represent its force, and the temperature of the air was about +15°. On the following day the wind was variable, and never of more force than the number two would represent; the temperature of the air was from +19° to +15°. The next day, Sunday, the 15th, the wind began to blow from W. S. W. at an early hour, and increased in violence till midnight, when it abated a little, and began to veer to the southward; it continued the whole of

Monday and Tuesday, with a force of three or four, and then veered to the E. N. E., and fell to one or two. The temperature during Monday and Tuesday ranged about + 20°, having risen from + 15°, which it was at, at the commencement of the south-westerly wind on the morning of the 15th. Suppose they got eastward of Cape Hotham, before the wind failed them the evening we saw them, they would have to accomplish thirty miles more before they could be in a position to take advantage of the next south-westerly winds, which to a certainty would close the ice in upon Cape Riley. With even a light breeze they might have got over those thirty miles; and, although we had not such a breeze where we were, the case might have been different with them at a distance from the land, and probably where there would be more open water, which itself would cause a local difference in the wind, both with respect to force and direction. It was difficult to come to a decided opinion, but it seemed to lean to the side that they would be entangled in the pack, somewhere, but beyond our power of rendering them any assistance. We had heard some of their officers or commanders say, that wintering in the pack was preferable to being in a place of shelter, upon the grounds that the ships would move to and fro with the drifting ice, and be set clear early in the season. There could not have

been a more fallacious idea with respect to the Arctic Regions; and, although it had come from high authority, we never believed that they had the remotest intention of attempting it. I do not know that ever a ship wintered in the pack within the Arctic Circle, without drifting southward. There may, however, be an exception to this in the unparalleled voyage of the "Terror" in 1836.

The Commander of the U. S. Expedition offered to let Captain Austin have any supplies, such as coals or provisions, that the vessels under his command could well spare on the eve of their return to America; but I do not believe that any transfer of stores was made, owing very probably to the circumstances under which both Expeditions had been placed when the "Advance" and "Rescue" bore up on the morning of the 13th. The most remarkable circumstance, however, was that no letters had been sent on board the ships that were to return. One would be inclined to think, that, however short a letter might be, it would be gladly received at home, coming as it were from winter quarters, and conveying intelligence of the winter quarters of Sir John Franklin's ships.

Captain Austin had sent out travelling parties with depôts, in the direction of Lowther Island, for the Cape Walker journey in spring, and also in the

direction of Melville Island. In our Expedition was reposed no confidence whatever in autumn travelling, especially if any part of the journey had to be performed over ice on the sea, which, even in the month of October, would not be exempted from the danger of drifting about. The greatest objection, however, lay in the extreme changeableness of the weather at this season of the year, and the obscure condition of the horizon. This can be proved, to the entire satisfaction of those who are most anxious to encourage travelling at this season of the year, by referring to a three-hourly register of the weather for the three weeks preceding the first week in October, during which time there will not be found an average of one hour out of the twenty-four in which the weather has been sufficiently clear to enable a person to discern objects distinct on the distant horizon. There is nothing in this opposed to what is known of the science of meteorology, and the laws which govern meteoric vicissitudes. When the sea in the Polar regions becomes almost entirely covered with one continuous sheet of ice, and the land becomes cooled down on the surface, far below the freezing point of water, nothing can be more rational than to expect a steady northerly wind, and a clear and keen atmosphere, and cold always increasing in intensity as the latitude is increased,

provided one continue always on ice or land, as the case may be. On the other hand, if the sea and the land be unequally heated, as must happen to a great extent in autumn, when the ice is drifting rapidly about, and large sheets of water are exposed to the air, to which it imparts a much greater amount of heat than an equal extent of land, and the land again imparts its heat or cold much more suddenly than the water or the ice. In this manner, when the face of nature presents the greatest diversity with respect to ice, water, and land, the conditions of the atmosphere, depending entirely upon the conditions of the earth's surface, upon the heat and light of the sun, and probably also upon the phases of the moon, will also vary in obedience to the varying circumstances of which they are the mere results.

The officers of the party shot a bear in the vicinity of Cape Martyr, very probably the one which Mr. Goodsir and I were tracking on the preceding day, which they willingly and kindly permitted us to have for the use of our dogs, upon condition that it should be properly skinned. The spot where they had left it was carefully described, and directions were given how to find it, by bearings from the land and by the position of the ships at Griffith's Island.

By falling in with our Expedition, the intention

the party had of going as far as Barlow Inlet was a little modified, as far as the plan of accomplishing it was concerned. It was determined now that a party should set out for Cape Hotham and Barlow Inlet, with an intention of returning the same night, and on no account run the risk of being caught in a storm; rather than run this risk, it would be better to wait until more settled weather should set in.

October 4th.—At seven A.M. Lieut. Mecham, Mr. Ede, Captain Stewart, and Mr. Goodsir commenced their journey to Cape Hotham and Barlow Inlet; and at the same time a party of nine men, with two sledges and the dogs, went to Cape Martyr to bring on board the carcass of the bear. Those of the crews that remained on board were busily engaged building our snow store-house. The morning was very clear and starry, and in this respect it was an exception to the twenty that had preceded it: there was a keen northerly breeze, and the thermometer was so low as $-5°$, until clouds began to rise from the horizon, and to drift before the increasing wind; then the temperature rose to $+3°$, but in the evening it again fell to zero, and at midnight to $-5°$. The barometer was about 29·90, and inclined to rise. As the day advanced the weather became stormy, and before evening there was a strong breeze with violently drifting snow. Some of the men who had been engaged at their

mason-work came off in consequence of the frequency of frost-bites of the cheeks and ears; none of the sufferers, however, ever lost more than a mere film of the skin, as they had learned by this time to attend to one another's faces and ears.

At five P. M. the Cape Hotham party returned very much fatigued, having travelled as far as one of the bluffs over Dungeness Point, and seen nothing of the "Advance" and "Rescue," to discover which, if possible, was the sole object of their journey. They suffered intensely from thirst, and one of them had his fingers slightly frost-bitten while holding the lid of a metallic pocket flask over a flame which had been raised with cotton rags and bits of fat, the refuse of their dinner, for the purpose of melting snow to quench their thirst. The sensation felt in his bare fingers, while he held the metal cup full of snow over the flickering flame, was of a burning character; and, at the time, he thought it was caused by the flame, which very rarely reached so high up on the sides of the vessel.

Eight P. M. arrived, but there were no signs of the return of the party at Cape Martyr; and, as the wind howled and the snow drifted with violence, and obscured the stars, which only peeped out at times, we began to entertain fears for their safety. Mr. Reid and I were sent out, with a party of three men

and refreshments, to meet them. Our orders were to proceed six miles from the ships, following the beach very carefully all the way, and, if we should not meet them in that time, we were to return to the ships without delay. Occasional glimpses of the stars in the intervals between the showers enabled us to keep in the proper direction when we had a difficulty in making out the beach. The hummocks were a great annoyance, and many a tumble did we get among them; but tumbles were not so bad as going over the knees in the water, which oozed up all round some of them where the ice was not permitted to rise freely with the tide. After proceeding about two miles we were fortunate enough to meet them, and it was so dark that we mixed with them before they recognised us. They were coming on very cheerfully, and like ourselves they often tumbled heels over head among the wreaths of snow and the hummocks. Some of them were very much fatigued, although they had very little to drag, for the dogs dragged one sledge, and the other was left seven miles from the ships when night came on and they could not see to take it along. One of them had the fingers of both hands rather severely frost-bitten. It was not the depth or extent of the frost-bite that I did not like, but the reaction and vesication that had commenced, as the result of partial attempts to restore

the circulation. That no time might be lost in getting to the ships, each of the party got a little spirits, which quickened their pace considerably, and at ten o'clock we arrived. Each person was minutely examined lest any parts, fingers or toes, might be frost-bitten unknown to the sufferer, but no other person had been the least touched except the person to whom allusion has been made, and, as he belonged to the "Lady Franklin," he fell under the care of Mr. Goodsir after the assiduous use of the remedial agents water and snow, in which his hands were kept for five hours, although during the latter part of that time they were so painful that he almost required restraint to continue them in it. At the end of that time reaction seemed to be commencing, and a system of treatment was adopted which had a tendency to keep it within bounds, lest there should be loss of substance by sloughing. Sensation had not returned to the points of the fingers, and this was taken for a sign that there would be a little loss of substance in those parts. On the back part of some of them, sensation was also deficient; from this we might fear that stiffness in the motions of the fingers might be the result, especially if the true skin should happen to be implicated.

October 7th. — There was a violent storm from N.E., which lasted two whole days and nights. During

the first twenty-four hours the temperature was about —5°, but latterly, as the wind veered to N. 22° W., and the sky became overcast (for it was only the horizon that was overcast before), it rose to +7°. The snow-drift was sometimes so thick that a person on the ice could not be discerned at a distance of two hundred yards.

No persons went into the open air, and any exercise we had was beneath our awnings, which were securely fastened down. We had great fears for the safety of the travelling parties that had been sent out by Captain Austin a few days previously. If any of them should happen to be exposed to the storm, and find it necessary to accomplish their prescribed distance, it would try their constitutions, if not injure them, and it would prove to them, as has been already hinted at, "that autumn is not the time for sledge travelling in the Arctic Regions."

The weather was beginning to improve, although still it was very squally, and the snow drifted along in great volumes. Lieut. Mecham resolved upon returning with his party to Griffith's Island. During their short stay in Assistance Bay, they were gratified by a display of one of the plans proposed to find out Sir J. Franklin, and hold communication with him in his distant and unknown abode. In the present case, however, it was not with the view of

corresponding with Sir J. Franklin's ships, but with home, that Sir John Ross sent off two balloons, with a carrier pigeon attached to each in a small basket. The attachment was effected with great ingenuity by means of a piece of slow match, which would liberate them after twenty-four hours. Sir John said that he expected in that time the wind, which was fair, would carry them into the latitude and longitude of the track of the whalers, and alighting on board those ships they would take a passage to England! The bottom of the baskets was the part by which they would escape, for it was fastened in by means of cord communicating with the slow match. Each contained a little split peas, to serve as a last meal for them before leaving their temporary abodes on their aërial passage. It was to be regretted that a well-filled balloon made its escape without its load, from the carelessness of one of the officers of the "Felix;" however, another was soon filled, and it was some consolation to know that the one that had escaped would act as a pilot balloon for the others, which, with their cars and enviable as well as immortal pigeons, we soon lost sight of, on their long journey to our native and happy land. There was no person so home-sick as to request earnestly a seat along with them.

Mr. Stewart, and one or two more persons belonging

to our Expedition, accompanied Lieut. Mecham's party to their sledge, which they reached a little after noon, and found in a state of perfect safety; but the sledge which our men had left on the 4th had been discovered by foxes, and the bear's flesh doubtless proved luxurious morsels to them on several occasions during the violence of the recent gale. After saying farewell to Mr. Mecham and his party, Mr. Stewart returned to the ships in Assistance Bay, where he arrived in the evening a little fatigued, having suffered as usual from excruciating thirst. I believe the true cause of such intense thirst is the extreme dryness of the air when the temperature is low. In this state it abstracts a large amount of moisture from the human body. The soft and extensive surface which the lungs expose, twenty-five times or oftener every minute, to nearly two hundred cubic inches of dry air, must yield a quantity of vapour which one can hardly spare with impunity. The human skin throughout its whole extent, even where it is brought to the hardness of horn, as well as the softest and most delicate parts, is continually exhaling vapour, and this exhalation creates in due proportion a demand for water. Let a person but examine the inside of his boots, after a walk in the open air at a low temperature, and the accumulation of condensed vapour which he finds there will convince him of the active state of the skin. I often found my stockings

adhering to the soles of my Kilby's boots after a walk of a few hours. The hoar frost and snow which they contained could not have been there by any other means except exhalation from the skin.

October 8th.—Mr. Petersen and several men started with the dogs and their sledge to the westward, along the coast; and in a few hours they were seen returning, with the remainder of the bear's flesh and the sledge on which it had been left laid across the dog-sledge, which the dogs were dragging along so fast that the men could only keep up with them by running. The dogs go very fast, when they are on their return, if they know the way; and then they do not make their track as crooked as when they require to be guided on by the whip.

The weather was very clear during the whole day, and the horizon was remarkably visible in every direction. There was also slight refraction to the westward. Mr. Petersen reported a large space of open water, extending westward to the south point of Griffith's Island, along the south shore of Cornwallis Island, and at the border of the ice which fringed it to a breadth of nearly a quarter of a mile. He said that nothing but water was seen to the westward as far as Griffith's Island, but he did not see the ships there, owing to a low stratum of misty vapour, which obscured vision in their direction.

The temperature of the air was much higher than we could have expected it with such clear weather. It ranged from +2° to +9°; perhaps, and it is not unlikely, the open water which has been reported, and the gentle easterly wind, may have been the cause of it. Whether we began to be more attentive to our faces and ears with our own hands, I do not know, but frost-bites of those parts were not nearly so common as they had been at first. It is not improbable, however, that the circulation in the skin might have undergone some peculiar initiation, which rendered it less subject to the cold; a slight hardening of the skin, to retard evaporation a little, might be quite sufficient to effect this change.

In case travelling parties from Captain Austin's squadron might have lost their way, or be in the neighbourhood of Assistance Bay, rockets were sent off generally at eight P. M. I do not know whether any of them were ever seen from the other squadron; but some of those which they sent off were seen from Assistance Bay.

October 9th.—As soon as the store-house was finished and the weather proved favourable, we commenced to remove such stores from the ships as we knew would not be injured by exposure to lower temperatures than we would have on board ship. Preserved meat and carrots, bread, flour, sugar, and

other articles of provisions in substantial packages, were removed without hesitation, and so also were the ropes and fittings belonging to the rigging, and the sails. It was carefully observed that nothing to attract foxes, or the dogs, was sent out of the ships, and all the provisions were in such packages as should be proof against the teeth of those invaders if they should succeed in forcing a passage, by removing some of the blocks of snow from the entrance, or by burrowing through or underneath the wall.

After clearing out the between-decks, we found abundance of room for spare articles, which had been very much in our way in the cabins, and in our berths, since the commencement of the voyage. In making these changes an opportunity was afforded for examining all the stores, and especially bottles and jars of pickled preserves. Some of them were found burst, and others only with the corks thrown out. The solid parts of their contents, and also most of the fluid parts, were not lost; but that part of the latter which contained the preservative principle and resisted congelation was invariably lost. If a bottle of porter became frozen, and consequently broken, a mass of ice was found, which, when thawed, did not yield porter, but a tasteless fluid of a slightly brownish colour, the solid and alcoholic constituents

having all escaped. Our ink, too, in small earthern bottles was frozen, and some of the bottles were broken, but none of the ink was lost; for the frozen mass, together with a little fluid which was found in the bottom part of the broken bottles, made as good ink when thawed as if it had never been frozen.

October 14th.—Our crews were busily employed preparing to bank up the ships with snow. Accumulations among the hummocks and at the beach in various directions were cut up into blocks, and sledged to the ships. This labour was divided among them, some were cutting it up with shovels and long knives, others loaded the sledges, while a third party dragged them to the ships. Nothing but happiness and merriment seemed to prevail throughout, and, after the day's work was over, almost all on board adjourned to the play ground, where various games were followed. The red and happy countenances, glowing with cheerfulness, which one met in the merry groups on the ice almost every evening, were ample indications of health, which were fully confirmed by the shouting, the gambols, and the tumbles in the snow, in which all participated.

Since coming into winter quarters, and establishing regularity in the amount of labour exacted from the crews, the scale of victualling had undergone a modification, which resulted in a great saving

of provisions, without reducing the daily allowance below what would be necessary in such a cold climate. It was always observed that in stormy weather, when the men could not engage in work or gymnastics, the amount of food consumed was considerably less; and since coming into winter quarters, although the temperature of the air had been forty or fifty degrees colder, there was less demand for food than during summer, when the labour which each had to endure was almost intolerable. In serving out provisions, our main object was to have the wants of the men supplied as adequately as possible; and as these depended entirely upon the amount of exercise taken, which varied very much at times, and upon the temperature, which also varied, the absurdity of establishing a scale of victualling for the whole year will be plain. In such a voyage as ours, where the object was to keep up health among the crews, without undue waste of the provisions, which could not be replaced, the plan which had been adopted was based upon the most correct principle, and any inefficiency that might attend its operation would depend entirely upon carelessness in keeping correct accounts of the stores as they might be expended. It is well known that, when seamen know that they are on strict allowance, they will continue to receive it, although

it may be much more than they can use; but if they have an idea that their commander is desirous that they should have enough without waste, the person who serves out the stores to the cook receives intimation that their allowance is more than can be used. Perhaps, such a system may appear to throw the ship's stores at the mercy of the crew, and without any doubt it does so; but it is on the safe side, and those in the merchant navy who have tried it can testify that there is a saving in it, of which they could have formed no idea. In the article of bread, in our Expedition, the weekly allowance was six pounds, and, at that rate, we had enough for three years. It was served out every evening, but not weighed, and the result of the not weighing system was generally a saving of nearly a pound per man per week. Of course, such a system is opposed to the beautiful regulations of the navy, and one who consults order and regularity would never wish to see anything superadded that might lead to anarchy; but, notwithstanding, it would be well to adopt some "sliding scale," which might have a safety-valve, both for the health of the crew, and the undue consumption of the provisions.

October 17th.—Our preparations for winter went on very rapidly, in spite of the stormy weather, which was not by any means unfrequent. The temperature

during the three preceding days had been but once below zero, although the sky was generally pretty clear; and the wind was for the most part northerly, or northerly and easterly. The change from thick to clear weather was hailed with great joy, although we should have liked to see the drifting snow also give way for a clear horizon. We had to desist banking snow against the sides of the ships, owing to the floe alongside sinking by the superincumbent weight placed upon it. Its thickness was only twenty inches, and the water from beneath oozed through it and became frozen; but it never became quite hard, and, when a person walked over it, his feet were in danger of being soaked through the cork-soled "Kilby's."*

Our hunting parties had been very little encouraged by success of late, so that they began to be ill got up and little cared for. The tracks of hares and foxes were frequently seen, but the creatures themselves were so shy, and the colour of their fur so much resembled that of the snow, that none of them were hardly ever seen, except when Mr. Petersen's traps imprisoned some of the latter. Great excitement was caused, in Assistance Bay, by a fox being observed with a collar round its neck. It found its way into

* Named after their celebrated maker at Woolwich.

our store-house, and hid itself among the casks. Twenty or thirty persons congregated at the door by which the poor thing had entered, while some went in to ferret it out; and when it was dragged out, the collar, instead of bearing the names of the "Erebus" and "Terror," as some of us were foolish enough to anticipate, bore the name of H. M. S. "Assistance," written but a few days before.

On several occasions, Mr. Penny and Mr. Petersen, with a dog-sledge, attempted to go as far as Griffith's Island; but bad weather or open water close to the rugged ice at the land always forced them to return. An attempt which they made on this day was successful; and at eight P. M. Mr. Abernethy, master of the "Felix," returned from a journey he had made towards Cape Martyr, and reported that he had seen them strike out from that point in the direction of the ships at Griffith's Island. We felt quite satisfied of their safety; and our disappointment from not seeing the rockets, which were to be sent off as the signal of their safe arrival, was removed.

October 18th.—Mr. Stewart and I went out in the direction of Cape Martyr, with the expectation of meeting Captain Penny, who said, when he left Assistance Bay, that he would return on the following day. The day and the excursion were remarkably pleasant; and although we did not meet our Com-

modore, for he did not return on that day, we did not consider the walk over the crisp snow and unyielding ice altogether unprofitable. The insatiable thirst we experienced had not become one whit more accommodating than it had been on our journeys six weeks before; in my estimation it was much less so, and the enormous draughts of water which we swallowed on our return to the ships would go far to prove that some mysterious outlet had been opened since we left them. The weather was very clear, and the temperature varied about +5°, but it was down to +1° and up to +9°; there was very little wind in the morning, but at night it freshened up to a strong breeze from N. or N. 22° W.

October 19th.—In the morning the weather was very unpromising, and we had no expectations that Captain Penny would be able to return; at noon the wind had fallen considerably, the sky was remarkably clear throughout its whole extent, and the thermometer was at +4°, but falling very fast. In the evening, Captain Penny and Mr. Petersen arrived, from whom we were glad to learn that all in the other squadron were in good health and spirits, and that no disaster had befallen any of the travelling parties that had been out in the first week of this month, although some of them were detained in their tents for two days in succession. Slight frost-

bites had occurred, but none of them were of a serious nature. Little or no good had been accomplished by these parties, except that some experience, both by men and officers, had been obtained; and in that respect much good might be the result, although it perhaps hardly compensated the great risk that was incurred.

October 30th.—The temperature of the air had fallen much in the preceding fortnight; the lowest we had observed was—14°, and it happened at a time when the sky towards the zenith was very clear and cloudless, although there was over the land and the horizon in some parts a thin misty film, which obscured vision a little. The weather was every day becoming more settled and the air sensibly drier, for there was scarcely a half-day in which the blue sky could not be seen, nor a night in which the stars were not twinkling like sparkling diamonds on the deep blue expanse which enveloped the bleak and dreary world around us.

The fishes that had been observed beneath the ice in Kate Austin Lake on the 14th of September were discovered to be a species of salmon, and on several occasions some of our men succeeded in hooking a few, through holes which they opened for the purpose in the ice on the lake. They did not appear to be very numerous, nor were they very keen in taking

the bait, which was generally a portion of the skin from the breasts of those that had been caught. The first one or two that were caught took a piece of pork or some animal substance of that kind; various schemes were tried, but none suited so well as the hooks, and I believe some of them failed altogether. From thirty to forty pounds were brought to our two ships, and perhaps half that quantity to the "Felix."

On Trafalgar day, which every naval officer commemorates with veneration, when our friends, the gallant Sir John Ross, Commander Phillips, and Dr. Porteus of the "Felix," met us at dinner on board the "Lady Franklin," we had a hearty dish of fresh salmon. Sir John said that he would endeavour to get a large one, which he himself should carry to Captain Austin, at Griffith's Island, although the distance was at least twenty miles. He was quite elated by the discovery that had been made; for it recalled with great force to his recollection how much indebted they were, in the "Victory" voyage at Boothia Gulf, to the supplies of salmon they obtained from lakes in the neighbourhood of their encampments. The ice on the lake was two feet thick, and the water at the bottom was at a temperature of 33° to 34°. It was rather a novelty to see one here and there, over the whole surface of the lake, squatted flat upon

the ice, at a hole, watching his hook and line, and continually removing from the surface of the water films of ice, which the low temperature of −10° to −14° as speedily produced.

Symptoms of scurvy broke out on board the "Felix," and threw the crew of that ship into a panic, which could hardly be removed without leaving impressions upon our crews that they too might be affected in a similar manner. It was impossible to make light of it, for every sailor has a good idea that scurvy is present when there are such symptoms as languor and indisposition, spongy gums, œdematous legs, and stiffness of the joints, especially the knees, accompanied by livid spots, not unlike the result of contusions. The appearance of scurvy, so early as four months and a half after leaving home, certainly implied that the provisions which had been in use were exceedingly faulty. We learned that the scale of victualling was very generous on board the "Felix," and that a very large proportion of preserved potatoes was in daily use. Now it comes to be a most important question: Did scurvy really appear among persons using preserved potatoes? If it did, then that tuber loses its valuable anti-scorbutic properties in the process by which it is preserved. I believe the crew of the "Felix" used them *ad libitum* for upwards of two months previous to the appearance

of that disease. There was but one course to be pursued with respect to the "Felix," and that was, to send supplies of antiscorbutics, as we might be able to spare them; for it was very clear that the provisions she had on board were not equal to the removal of that disease, since it had come on under their use. Accordingly, the preserved carrots, with which our expedition was so munificently supplied by Mr. Hogarth, were highly prized by the crew of the "Felix," and a larger allowance of them was granted every week. Fresh potatoes, too, were devoured in a raw state by some of them, and this evidently proved the great demand there was for succulent vegetable matter. We let them have potatoes to be used in this way as long as they could be spared. The man who was affected sensibly with the disease was allowed some porter, which was sent over once or twice a week for his special use from the "Lady Franklin." It may appear strange that a disease in another ship, which was quite independent of our expedition, should call for aid upon its first appearance. We wished to prevent it taking a deep hold of those who were likely to be affected by it; and it was with this view that such active measures were adopted, knowing that, if once it fairly established itself in their minds as well as in their bodies, far greater supplies would be required; nor would they be equally useful then in

curing the disease as they might be now in preventing it. It must be acknowledged, however, that although they were very reluctantly received, owing to the etiquette which was necessary to be observed with respect to stores belonging to the Government, they were consumed without any such feeling, in obedience to the wants and longings which their absence had excited in every person on board the "Felix." If we had permitted the disease to have gone on without heeding it, except by merely inquiring for those affected by it, in another month it would have been probably established to such an extent that five times the quantity of supplies that would check it now would then hardly keep it in abeyance.

The ships were by this time almost completely banked up with snow, and a gangway of the same material, with two parapet walls sloped gradually from the door in the awning to the surface of the ice. The dogs were now located on the ice in a little snow-house at the ship's bow; with a quantity of straw between them and the cold and soft ice beneath. The ice in the harbour was upwards of two feet thick. Since the 26th of September, when it was ten or eleven inches, it increased at the rate of half an inch per day. The ice on Kate Austin Lake presented the same thickness with that in the harbour, although it was seven or eight inches

thick when the harbour was one continuous sheet of water. This may appear rather strange, seeing that fresh water freezes at a higher temperature than sea-water; but it may be proper to observe that sea-water ice, from the saline matter which it contains, will probably conduct the heat faster from the water underneath than fresh-water ice, and also that the saline matter, reduced to a low temperature at the surface, sinks while the water is congealing, and cools the stratum into which it descends. The lakes a little beyond the beach — to which allusion has been made already — were frozen to the bottom, although the depth of some of them was more than two feet. This is probably owing to the proximity of the ice on the surface with the bottom which must conduct the heat away from the water, laterally, in addition to the action of the air at the surface. It is not improbable that in the centre of Kate Austin Lake the bottom does not present ice even after winter has devoted itself to the extension of the ice from the sides towards the centre. Here, then, we would find a perforation in the frozen crust, which envelopes the earth's surface in this high latitude. Were it not so, it is highly improbable that the salmon could exist between two ices.

November 3rd. — During the whole of the month of October the sun was very frequently attended by

most beautiful and brilliant parhelia and parhelic circles, which were, for the most part, prismatic at first, but were always becoming less so as the meridian altitude decreased. At noon this was remarkably well seen, for the mock suns were so bright, and of the same yellow colour as the sun, that it was very difficult to make any distinction between them. Where the sun itself was, there appeared to be two suns, placed the one above the other, not vertically, but at an angle of 45°, and a little more than one diameter apart. The temperature of the air always varied according to the state of the weather, with respect to cloudy or clear, and the direction and force of the winds. The minimum for the season was −18° during a north-easterly breeze and clear weather, and the maximum for October was +18° during a south-east wind and thick weather. During the nights, which now were beginning to be rather long, the sky was generally very clear, and nothing could be more pleasant than a midnight walk on the floe about the period of full moon. We looked forward to the winter with great confidence that it would be short and happy, as our circumstances had to be accommodated to the absence of the sun for a short time.

CHAP. XIV.

DURING THE ABSENCE OF THE SUN.

Temperature of the Cabins.—Vapour in the Berths.—Bad Effects of damp Beds.—Temperature of different Regions, and the Presence of Moisture.—The Esquimaux lost.—Scurvy extending.—Theatricals. —School.—Libraries.—Peculiar Meteoric Phenomenon.—Violent Gale.—Soft and hard Snow.—Paraselenæ.—Lucubrations in the open Air.—Mud from the Bottom.—Infusoria.—The Weather in November.—Luminosity of the Sea.—A minute Acaleph.—Temperature and Density of the Sea-Water.—Experiments.—The shortest Day.—Christmas.—Balls and Masquerades.—Supposed Route of the Missing Ships.—Open Water in Barrow Straits.—Refraction.—Aurora Borealis.—Temperature.—Mercury frozen. —Preparations for Travelling.—Temperature of the Ships.—Bedding.—Washing.—Condensed Vapour in the Funnels.—Barrow Straits still open.—Chloride of Silver not blackened by free Exposure.—Water-Cresses.—Porter and Ale frozen.—Raw Potatoes. —Soot in our Cabins.—Return of the Sun.—Effects of Winter.

Nov. 14*th.*—Soon after coming into Assistance Bay, the temperature of the secluded parts of the ships fell so much that the vapour in those parts became condensed, and appeared on bolt ends and the ceiling in the form of large drops, which sometimes ran down in streams, much to our annoyance, especially when it occurred in our sleeping-berths. Some of the crew— and I among the number—complained of rheumatic

pains of the joints, which were always removed for the time by walking and exercise, and were undoubtedly the result of the dampness of our beds. After the temperature of the atmosphere fell, as the season advanced, these apartments became cooled below the freezing-point of water, the result of which was the congelation of the condensed vapour into ice, which accumulated enormously in our beds, so that it was by no means unusual to find our blankets adhering to the boards close to the ship's side, and occasionally one's night-cap would become fixed in a similar manner. For six weeks the temperature of my little cabin was not above the freezing-point of water, and it was generally about + 22°. Of this I had an excellent proof in the fact, that a tumbler containing a large mass of ice in its bottom lay upon its side for the whole time without the latter being dissolved. But our rheumatic indisposition disappeared entirely; and every person was satisfied of the truth of Captain (now Sir Edward) Parry's observation, that no inconvenience arose from the condensed vapour while it remained in the form of ice, no matter in what quantity it accumulated. After the banking up had been brought to a close, and our decks were covered with a layer of snow over half-inch boards, with felt underneath, the ice in our beds again melted, and water dropped into our blankets

until they were sensibly wet. The re-application of the cause excited our rheumatic affection; and we could have wished the embankments and the snow on the deck had been a little less extravagantly applied until the diminution of the temperature of the external air again reproduced the ice, after which everything went on comfortably. It would never have suited to keep up a heat on board ship to prevent the condensation of insensible vapour into water; for the difference between the two temperatures to which we should be exposed on board ship and in the open air would be so great as to injure our health. The safest temperature for men to live in on board ship during winter is about +40° or +50°; but a range of from +30° to +55° may suit very well; and with it, in the main cabins, hoar-frost in the beds will never thaw if they are arranged along the ship's sides, where the beds are generally placed. It may appear exaggerated to state that the difference between the two temperatures to which we might be exposed alternately many times in the day throughout the winter, would, even with the above moderate, and in the eyes of some very low range, be greater than the change which a person would experience by being transferred from the severest winter in Great Britain to the hottest part of the intertropical regions. For example, in the

cabin of the "Sophia" +60° might often be expected, and, in the open air, not unfrequently −40° would doubtless be felt before the end of winter. Between these two extremes there are 100 degrees,—fully three times as much as the difference between the mean temperature of Great Britain and that of the tropics. But if the cabin should be heated up to +72° or more, and the air cooled down to −50°, which also may be expected, the two extremes would be found 122 degrees apart. Let 122° be added to +38°, about the mean temperature of our winter months, and the result will be +160°,—something unheard of, so far as I know, in the hottest tropical climate. This will explain the difference of temperature to which we were alternately exposed; and it will show that two distant extremes of heat and cold can be endured with impunity when there is little or no moisture present, and when those extremes are not owing to undue heating, but to low degrees of cold. It will also be clear, that nothing can hardly be more absurd than to increase the distance between these two extremes by the extravagant use of fuel, which ought to be used moderately, and is one of the most indispensable articles in an Expedition in the Arctic Regions.

The Esquimaux on board the "Felix" disappeared, and no one knew whither he had gone. It was conjectured that he had left his ship with the inten-

tion of going to Griffith's Island, but the weather proved so exceedingly stormy for two days after he had been missed, that few expected he should have found his way, or have been able to plod on over the hummocks and the deep wreaths of snow. Yet he accomplished the journey he had undertaken; but, "starless exposed," he had to pass one night in the open air, at the mercy of the howling winds, and drifting as well as driving snow, while the temperature of the air varied from $-10°$ to $-3°$. Should a bear, in one of his midnight rounds, have haply crossed the track of poor Adam Beck and followed it up, I leave the reader to conceive the appalling result. After remaining a few days on board the ships at Griffith's Island, he was dismissed by Captain Austin, who readily conceived the anxiety that prevailed concerning him on board the "Felix," and in Assistance Bay generally; and he arrived at his own ship, which he fully expected he had left for the winter, on the same day that he left the other squadron.

The crew of the "Felix" were still affected with scurvy, and new cases were occurring, without the old being removed from the sick list. Dr. Porteus found it an arduous duty to keep up the spirits of the sufferers; and it was not without its difficulties, for the treatment he could adopt without altering the bill of

fare, which was impossible by their own resources, would prove of very little value in the removal of the disease. The raw potatoes were still eaten with avidity, and the allowances of carrots, &c. were increased to meet the increasing demand. One poor man, over whose grey head many a coarse and stormy night had passed on the ocean, had a knee affected to such an extent that he could not get out of bed. It had suffered from some violent injury many years previously, but appeared to have quite, or nearly quite, recovered its perfect use and freedom of motion, until, more than two months ago, symptoms of weakness and swelling came on, and gradually became worse, until he was fairly laid up by it. In his case we had an early and an unequivocal indication of the presence of scurvy on board the "Felix" before it had been generally understood or allowed that there was present any disease whatever. The eagerness with which our preserved and fresh vegetables were sought after, was a proof that they excelled in nutritious properties the preserved potatoes, so abundantly in use on board the "Felix." Allusion has been made to this already; but even here the question must not be permitted to drop, until it shall be proved that they really did or did not prevent the appearance of that disease.

On the fourth of this month, when our universi-

ties in Scotland were receiving thousands from all parts of that happy country within their venerable walls, to commence the labours of the session, and when the long evenings for balls, theatres, and operas, were setting in, and fashionable life was beginning to leave its pleasant rustic seats, to pass the winter in many a flourishing city, the Arctic Academy was opened under the favourable auspices of our commander; and the boards of the Royal Cornwallis Theatre were graced by a company of actors, who seemed determined that their audience should not want the amusement to be derived from their able performances. Mr. Goodsir and Mr. Stuart, the medical officers of the "Lady Franklin," were the directors of the performances, and Walter Craig, one of the seamen of the same ship, was the stage-manager, while the performers were selected from time to time out of the respective crews of the three ships in Assistance Bay. The music was generally tolerable, and certainly the songs were such as to disarm, if not to charm, the severest critic. The diversity of character, even among forty individuals, presented almost every shade from the sturdy Highlander to the Cockney. Those who were most desirous to please their audience generally made the greatest number of failures; but, if possible, the amusement of a "break down" was better than the

completion of the piece; although those through whom it occurred were always disappointed. The theatre was on board the "Lady Franklin," and there was comfortable accommodation for upwards of fifty persons. Sir John Ross and Commander Phillips were generally present; and nothing was more common than to see the Arctic admiral keeping time to the music with both feet and hands, and at the conclusion of a piece uttering a few words of approbation, which were as heartily merited as they were bestowed. All went to the theatre to laugh and be laughed at; and those who "broke down" afforded as much amusement as those who went smoothly and "charmingly" through their performances. Saturday night was generally chosen for these festivities, until the good sense of the commanders thought that the Sunday duties were interfered with, and then some other night or nights of the week were appointed. The preparations which generally preceded the performances for one evening, and the subsequent small talk concerning merit and demerit, occupied the attention of the seamen, and enabled them to pass over hours that might have otherwise been taken up in despondency, which doubtless could not be conducive to health.

The printing press which had been provided for us before leaving home by the kindness of some friends

was very useful in printing the bills, announcing in detail each of the performances, and giving fictitious names by which the characters were to be sustained. One of the most amusing of the songs was that of "Shon McNab;" and it pleased so well, that scarcely a "theatre night" was permitted to pass without it; so well indeed, that "special requests" for it became very common, and the person who represented the original "Shon," although not a Highlander, became a general favourite with men and masters, but with none more than with Sir John Ross. The dresses for some of these occasions could not be got up very sumptuously; however, some calico (both black and white) which had been supplied to the Expedition by the extreme kindness of Mr. Smith, for the purpose of making kites, became very useful in this way, without interfering with its usefulness and application to the purposes which its generous donor had originally intended.

The school was conducted four nights in the week, and three hours each night, in the half decks, by the medical officers of both ships; and, generally speaking, the men appeared to be very desirous to improve in the various branches of a common school education. Reading, writing, and arithmetic, were attended to, and, occasionally, geography was introduced. Some of them were really very ignorant; and those were

the persons who were least desirous to learn anything that cost them an effort. It was heartless work for the man of thirty-five, who had been married for fifteen years, to sit for hours together poring over the simplest arithmetical calculations. There were about a dozen in the "Sophia" who gave fair promises that before winter was over they should be able to work a lunar distance, or navigate a ship to any part of the world. They all appeared to be interested in geography; and although we were very deficient in geographical books and maps, having only one very old map of the world, and a single copy of that excellent work, "Johnston's Physical Atlas," which did not belong to the ship, it was astonishing with what facility a very correct idea of the form of the earth, the distribution of land and water, the sources, directions, and terminations of the rivers, the mountain chains, with their heights, the extent and boundaries of kingdoms, the distribution of heat and cold, of animals, and of the varieties of the human race, was obtained by persons who could hardly sign their names, when practical illustrations of the various subjects were made. From the experience of seamen in their voyages round the world, now crossing it from east to west, and again running due south or north, while a third time they traverse it from

Quebec to Australia, thence to the Cape of Good Hope down to New Zealand, and up the Mozambique, eastward through the Straits of Malacca, saluting the Celestial Empire, thence round by Cape Horn, stealing guano from the Chilotans and the Patagonians, after they have paid their respects to the Emperor of the Brazils, and been taken before the Consul at Rio de Janeiro, for attempting to run away for the "diggings" at California, their understandings are easily reached, when geography is made practical by continual reference to the map, and to the fact that the world is round. It was found that much good was to be done by bringing geography before them; for generally, after they were left by their teachers, discussions were commenced whether Cape Horn is an island, or the Chinese are all Romanists like the Mexicans, and whether the crocodiles of the Nile and the alligators of the Mississippi are the same species of animals; and it was often necessary to reply to their interrogations, and to settle disputes, upon which had been exhausted all the experience they could accumulate in the forecastle, where there were persons who had been in all parts of the world.

We had slates and pencils which had been supplied at Aberdeen, and also some paper, a little of which could be spared to the seamen. This

proved very useful to all who had a taste for writing and arithmetic. About eighty volumes were sent on board the "Sophia," and upwards of twice that number of books on board the "Lady Franklin," by the government, for the use of their crews during winter. These we found very useful; and it was fortunate we were permitted to change them from the one ship to the other, as soon as they were read. Through the extreme kindness of Lady Franklin, some very useful works on the Arctic Regions were sent out to us in one of the ships under the command of Captain Austin, which we received about the end of June, when we first had communication with that Expedition. One of the seamen who had been in search of Sir John Franklin a great many years ago on the coast of Van Diemen's Land, received a book with his name inscribed in it by that lady, on which account he prized it very highly. We also had a small collection of religious books from the library of the Mariners' Chapel, Aberdeen, for which we were indebted to the kindness of Mr. Longmuir, the minister of that chapel, whose zeal for the general welfare of seamen entitles him to their thanks and support. These books, together with tolerably large collections belonging to the officers of both ships, were put into the men's hands from time to time, and exchanged as often as

was necessary; and of course the result was, that a taste for reading was acquired by them, which increased with their increasing knowledge. For our use in the cabins our own collections afforded much more varied reading than our time would allow to follow up; and from the collection that belonged to the ship we could get a reading of the Admiralty Manual of Scientific Enquiry, "Darwin's Naturalist's Voyage," "Humboldt's Cosmos," &c. &c.; books which are inseparable from the libraries of travellers and seamen. Some of us had no small reason for regretting that the Admiralty Manual had not come into our hands before leaving England, where alone provision could have been made to enable us to follow up the valuable investigations which are therein succinctly treated.

On the 9th, 10th, and 11th we had a violent snowstorm, which came on very suddenly from south-east: the barometer had been falling with a light northerly breeze, with clear weather and almost a cloudless sky, for twenty-four hours previously, the temperature ranging from $-17°$ to $-10°$. On the previous night, between the hours seven p. m. and midnight, there was an appearance on the southern horizon which a little resembled aurora borealis, and illuminated the snow beneath it. It commenced about south-east and

moved imperceptibly to south-west, where it disappeared about or soon after midnight. The oscillatory motions of the aurora were altogether absent, nor was there the usual arch-like appearance. The only respect in which it had any resemblance to that beautiful meteoric phenomenon, was in the light yellow colour with which the snow beneath was enlightened. Immediately before the gale came on, the wind was from north, and the temperature was $-17°$. In less than ten minutes there was an eight-knot breeze, and the temperature was up ten degrees. The change was so sudden, that the funnels through which the smoke had to escape had not time to accommodate themselves to the new and opposite direction which the wind assumed: the result was, that our cabins instantly filled with smoke, and the alarm of fire was given; but this alarm was soon put down, and the smoke escaped by its proper passage as soon as the wind skews of the funnels were shifted to the weather side. In the same time the barometer fell nearly $\frac{1}{10}$th of an inch; and after thirty hours of an incessant gale, which the number 11 might represent with regard to force, accompanied by snow, when the first sign of amendment took place, it had risen but $\frac{1}{200}$th of an inch, having fallen ·505 from 29·75 to 29·345; and the temperature increased gradually from $-17°$ to $+8°$. It con-

tinued fifteen hours longer. In this time the thermometer rose to +13°, and the barometer to 29·45; after which, having abated to a force represented by three, it veered round to north-west, and blew violently for upwards of twenty-four hours longer. In this time the temperature fell to −17°, and the barometer rose to 29·90, and clear weather was established as the wind fell. The snow which had fallen and accumulated into wreaths during the south-east part of the gale, was removed almost entirely; and if persons happened to have been walking over them in any part, the foot-marks, which had been left by sinking deep in the soft snow, remained raised distinctly above the surface of the original snow on which the recent wreaths had formed. This was owing to the compression caused by the weight of those passing over it, and it prevented the snow beneath the mark of the sole being driven away. We had a clear proof in this that the wreaths which accumulated during south winds were not permanent, while no wind whatever could affect those that had accumulated during northerly winds.

November 23rd. — That beautiful meteoric phenomenon which is described by Sir Edward Parry, and in all respects resembles a parhelic circle (*paraselenæ*), was observed in the evening. The sky was

almost perfectly cloudless at the time, the only exception to this being a thin mist or cloudy film, which was drifting on the horizon and the north-western sky, before a gentle northerly breeze. It is pleasant in these regions to walk by moonlight. The stars blinking as if they were about to go out, the bright moonshine, the pure blue sky, and the snow of spotless whiteness, all excite the profoundest admiration of the works of the Most High. The death-like stillness which reigns throughout nature carries us away into the world of spirits, and we are thrown passively into the wide arms of Omnipotence, until the cracking sounds of the rending ice around the harbour when the tide is receding, or the noise of the young ice at the offing, which resembles the mingling sounds of distant waterfalls when it is advancing, remind us that we still belong to the cold and dreary world.

A portion of the fine mud, and a little sea-water from the bottom of Assistance Bay, seven fathoms water, which contained abundance of decomposing vegetable and animal matter, and living polygastrica, was allowed to stand for a few weeks in my cabin, where the temperature was frequently below +24°, and never above +32°. The mud settled to the bottom of the vessel, and left about an inch in depth of supernatant fluid, which I examined very frequently. It soon teemed with infusoria exactly the same as those

that had been in it on the first examination to which it was subjected, immediately after coming into my possession; and I could follow them on the field of the microscope, as they enjoyed their merry pastime in thousands among the shreds and meshes of organisable matter in which the fluid abounded. Large individuals were frequently observed, full of ova, which they could be seen permitting to escape into the fluid, in which they were to take up their future abode. A little of this fluid was added to about twenty times its volume of sea-water in a wine-glass, and allowed to remain quiet and undisturbed for ten days, exposed to the air, except under such a cover as might prevent the access of dust, and to a temperature of $+27°$ to $+34°$. In a day or two a film of creamy-looking organisable matter appeared on the surface, which prevented evaporation, and thus assisted its countless inhabitants to maintain a higher temperature than that of the air around them. The first examination proved that reproduction was going on by the discharge of ova, which appeared like a pavement of sparkling ocelli in the cambium on the surface; while the water itself presented a living mass of creatures of great beauty and fertility. Subsequent examinations, after the cambium had disappeared from the surface and evaporation had commenced, showed very clearly that reproduction was going on, not by

the discharge of ova now, but by transverse fissure. I could see twos very abundant, some attached by what appeared to be a very slender hold, which often gave way before my eyes, while others were attached from side to side, and between those two extremes there were all stages of separation. The cilia of both seemed to act simultaneously from a state of perfect rest to active motion,—now standing, now moving forwards, now backwards, slower, quicker, to this side and to that; now appearing to be listening attentively, and again running, as if from an enemy: each two acted with the utmost harmony, and, slender as the bond of union might be when a magnifying power of 280 diameters could not detect it, they appeared to be under the influence of the same will. It was very pleasant to watch them between two plates of glass, with a microscope; and not without reluctance did I wipe them into a towel, and out of existence. There were also very large naviculi in the fluid, which at one time I thought were reproduced by longitudinal division: this was very doubtful, for they did not appear to multiply in nearly the same proportion as the ciliated species, nor was I certain that they were in a living state or endowed with the power of locomotion.

November 30th.—During a northerly wind and a clear sky, on the first day of this month, the temperature fell to −17°. The maximum +13° was on the 11th, during a strong S.E. gale, accompanied by

thick snow. The minimum −24° was on this day, during a northerly wind and clear weather. The lowest temperatures always occurred during northerly winds and clear weather. The winds were now prevailing from about N. or N. 22° W., although occasionally there were smart breezes from the southward, accompanied by dense falls of snow.

The floe in the harbour was upwards of three feet thick, but even at this thickness it yielded to the weight of snow which had been banked up around the ships; and the "Sophia" was in consequence surrounded by a trench of water, which was deepest close to the embankment, and shallowed away gradually until, about six or seven feet from it, there was no water nor deflection of the ice. The water thus coming to the surface did not all freeze, although the temperature was much lower than would be necessary to freeze the surface of sea-water. A part of it, however, became frozen, and the remainder, charged to saturation with the saline ingredients, sought its way through the ice to the water underneath.

We had frequent displays of Aurora Borealis; but in consequence of not possessing the necessary instruments, the magnetic perturbations of which that beautiful meteoric phenomenon is the result, passed by unheeded. The atmosphere was every day becoming sensibly clearer and freer from vapour,

During the absence of the moon, the nights exhibited that dark appearance of the sky towards the zenith, which is so common in the Arctic Regions; and which is owing to the absence of vapour, and a rarefied condition of the atmosphere.

The crew of the "Felix" were beginning to cheer up. Eight cases of scurvy had occurred by this time, all of which were inclined to improve under the use of the carrots, which continued to be supplied from the "Lady Franklin." The other stores of the "Felix," such as lime-juice and sugar, were beginning to be very short. The deficiency was made up from our Expedition, as far as was consistent with our own safety and the demands of the invalids.

December 3rd.—The sea-water in the fire-hole astern of the ship was frequently observed to be luminous, especially when agitated by the tide-line that passed through it to the bottom. I endeavoured on several occasions to ascertain the cause of this, by examination with a compound microscope, and also with a simple lens; but there was considerable difficulty in doing so, from the large quantity of water that had to be submitted to the microscope, and the rapidity with which congelation took place after it was removed from the sea, and before it could be taken on board. But a little ingenuity obviated these difficulties. A minute acaleph was discovered, which

seemed to possess cilia, but as their motions were very indistinct, it was very doubtful whether they were present. The motions of the entire creature, however, were very distinct, appearing to be effected by alternating contraction and relaxation. Without a micrometer, it was impossible to ascertain its exact size; however, by comparison with other objects of known size, it appeared to be about $\frac{1}{700}$th of an inch in diameter. The shape was perfectly globular, except when in a state of motion, and then it was rudely pyramidal. Each contraction followed by immediate relaxation, performed with instantaneous quickness, was followed by a state of quiescence, in which there was always a return to the globular form; and it was during this period of repose that the presence of cilia was detected, although very indistinctly. Its colour and consistence were that of a transparent, almost colourless jelly. There is no doubt the creature was an acaleph, probably in a rudimentary stage of development. In one of the contractile efforts it appeared to burst, and it then disappeared like a soap bubble, for which I might look in vain. This circumstance gave rise to the idea, that the motions which had been observed were performed convulsively, and were not peculiar to the creature in its natural condition. If this be a correct idea, it will give rise to another, that cilia were really present, and that they

constituted the chief, if not the only means the creature possessed, of changing its position in the water.

The temperature of the sea-water could not be ascertained with anything like precision, owing to the defective state of our thermometers, which ought to have been such as would indicate within half or a quarter of a degree of Fahrenheit's scale. Some of them were ascertained, by means of the freezing point of water with the barometer at 30 inches, to have errors of two or three degrees; and none could be read to a lower division than half a degree. Ever since the harbour became frozen over, we found the temperature to be about 29·5° or 30°. Before this took place, we found it so low as 28°; but that was generally when it was in a state of agitation by the winds, the temperature of which was considerably below + 28°. This is easily accounted for by the saline portion being kept in a state of intimate admixture with the water by agitation, after the former began to be precipitated by refrigeration. When a quantity was taken out of the fire-hole, it invariably contained ice at 29·5°, and also after its temperature rose considerably above 30°, but not to 32°, the last particles of ice had not entirely dissolved. A portion of sea-water, at a temperature of 33°, of specific gravity 1·0264, was exposed

to a temperature of +18° for several hours, after which the vessel, with the mass of ice which it contained, was inverted, and allowed to remain several hours more in the same temperature. A fluid escaped from it in drops, which was collected in a vessel placed beneath it; and its specific gravity was found to be 1·1004. This was one of a number of experiments, all of which gave similar results, and proved very clearly that a portion of sea-water will maintain a fluid state, by the proportion of its saline ingredients being increased, according to the diminished temperature to which it is exposed. The ice which formed at +18° was dissolved, and its specific gravity was found to be 1·015. This led me to ascertain the density of the water obtained, by dissolving a portion of the ice in the harbour, which had formed at a temperature of +18° to +20°, and had increased in thickness from beneath at much lower temperatures; and although the results in each experiment were not exactly the same, they proved that sea-water ice hardly contains one-fourth part of the salt of sea-water. The exact proportion will depend upon the temperature, it being very probable that the lower the temperature is, the more salt the ice will contain. When the ice in the harbour was three feet thick, a square cube was removed from it by being cut out with ice-chisels.

Nearly two feet from its upper surface downwards it presented a very hard structure, and very much resembled sal-ammoniac; the lower portion, which occupied the remaining foot, was soft, pitting before the pressure of one's finger, and of a very spongy structure. The upper part transmitted light very badly, it being as much as a person could do to ascertain that there was a light placed on the opposite side; the lower portion, however, transmitted it much better. This difference in the property of transmitting light between the upper and lower portions was owing to the former being more perfectly frozen than the latter, in consequence of which it would contain more air: this was clearly seen from the comparative dryness of the upper part, while the lower was discharging water, and producing a fringe of icicles all round it.

December 22nd. — The shortest day at length arrived. In the morning it was very close, but we expected it to clear up; at noon, however, there seemed to be very little chance of that taking place. The sky was overcast with mist and clouds; and the horizon was obscured with flaky snow, which was falling in all directions around us. The weather was exceedingly mild, for there was very little wind, and the temperature had risen from $-25°$ to $-4°$. Those who had been attempting to read the brevier

type found it too small, but there were some in the Expedition who could make it out. We always found that, at noon, the thermometer in the open air could be read off quite correctly with the light which the southern horizon afforded. The health of our crews, up to this time, was remarkably good, and the comforts of the various apartments of the ships could hardly be excelled. The presence of water in the beds, or anywhere else, was no longer a source of annoyance, for ice had taken its place, and accumulated in very great quantities. The slight rheumatic complaints, which some of the crew spoke of when their beds were a little wet, disappeared; and all of us looked forward to a speedy termination to the winter, as our Christmas festivities were fast approaching.

December 30th.—The Christmas festivities passed away cheerfully, and were remarkable for nothing, except that the crews of the three ships dined on Christmas Day on board the "Lady Franklin." The between-decks of that ship was cleared up, where the theatrical performances were conducted, and sufficient accommodation was made for fifty persons to sit down to dinner. The dinner cost the Expedition little more than the usual allowances of provisions; and, at such a trifling expense, the seamen were all afforded the materials for diversified conversation for a considerable time. During the dinner they conducted

themselves in a most orderly manner; and after it, their loyalty to their sovereign, their respect for their commanders, their fond remembrance of their fellow seamen at Griffith's Island, and their sympathy with the friends of the missing, were not forgotten; and but for one or two persons who became a source of rather unpleasant amusement to their more quiet companions by being a little quarrelsome, the utmost harmony prevailed throughout the whole evening.

The winter was passing on very rapidly, and was leaving no such gloomy impressions as we had looked forward to, from the descriptions we had frequently read of Arctic winters. The duty we had to discharge, combining, as it did, humanity with discovery, tended to dispel everything of a gloomy description from our minds. But in addition to this, we had our schools and plays, our pic-nics and fashionable dinners; in nautical phraseology, we had "yarns," which mean anecdotes or stories, from all parts of the world: each amused his companions, whether it was in the quiet game of chess, or in whist, in which much cheating was sometimes practised; and, above all, we had keen discussions with respect to the most probable route the missing expedition had pursued. The merits of the various routes to be followed by travelling parties in spring and summer were fully discussed, and each route had

some one to say something in its behalf. There were in our Expedition some who never had any other idea than that the missing ships had gone up the Wellington Channel: there were others, however, who said that they had taken the route to Cape Walker; and there was a third party who would not take upon themselves to say that they had gone the one way or the other. Those who were for the Channel route were at first in the minority; but by giving good reasons for their opinions, and by establishing the proposition brought forward by Col. Sabine, in the Preface to his translation of "Baron Wrangell's Travels on the Northern Shores of Russia," their numbers increased, and in a very short time a single voice was not to be heard but in favour of the Wellington Channel. This was very proper, because the understanding to which Captain Austin and Mr. Penny had come, left the channel for our Expedition; while the Expedition at Griffith's Island was to accomplish the various routes, to Cape Walker, Bank's Land, Melville Island, and the south shore of the Parry group or North Georgian Islands. The missing ships might have taken either of these routes; but it suited our purpose best, to establish the idea among the seamen, that they had taken the one which we now intended to follow.

The weather was very favourable, on most occa-

sions, for recreation in the open air, and for excursions to the land around the bay, and to the offing, where even yet a large lane of open water was seen along the land ice on which we were walking, except when the pack ice came in with the tide, or with a southerly wind, in which case it was transferred to the opposite side of Barrow Straits. We could see vapour ascending like columns of smoke from all parts of Barrow Straits; this could only take place from the exposed surface of sea-water, and there is no doubt the exposure which might be necessary was effected by the whole pack shifting about, under the influence of wind and tide, during the whole winter. It was often reiterated in our hearing, that the water which we so often observed was on the surface of the ice! Than this, I know nothing more unlikely, for it was invariably observed in Barrow Straits, where the ice would be at greater freedom to float on the water than close to the land. Even in Assistance Bay, the ice rose and fell with the tides; and in the fire-holes, the water-line on the ice never varied a quarter of an inch. If the ice be supposed to be overflowed by the water, the thickness which it may acquire in a single season will be very different, indeed, from what we have been accustomed to; and the heat of half-a-dozen summers may be required to dissolve the formation of a single winter. The result of sea-water

being exposed to the air at such low temperatures as −20° to −30°, was invariably the ascent of heated air and vapour, which distorted in a remarkable manner the land on the S. shore of Barrow Straits, and Griffith's Island to the westward. The most fantastic shapes appeared and disappeared with great rapidity, and afforded great amusement to the beholders. They could see flag-poles, with their streaming banners, castles in the air, and fairy halls, obelisks, pyramids, and rugged mountain heights, all in rapid succession: at one time the resemblance of a man of the most perfect form and development, in a few minutes dwindling into a mere pigmy, and again swelling out into huge giants, who, like their predecessors of whom we had often fondly read, in their turn assumed the form of all sorts of beasts, from the elephant downwards.

The Aurora Borealis was frequently observed, but the extent and brilliancy of this beautiful meteoric phenomenon never equalled what had been seen in September and October, while crossing the Atlantic in the latitude of Cape Farewell. The black appearance of the sky towards the zenith, at midnight, was every day becoming more apparent, and the stars sparkled like diamonds upon it; but hitherto it did not approach the limits of the blackness, under similar circumstances, described by Sir John Ross in his

voyage in the "Victory." The lowest temperature entered in the register was −37°, and it happened on the 1st and the 3rd; the maximum was −4°, at noon of the 22nd, being the shortest day. With the minimum temperatures, the wind was northerly and the sky clear; and with the maximum it was southerly, and the sky densely overcast. The wind frequently varied much in force when it was northerly, but the variations never assumed the character of squalls; for from a force represented by 2, puffs of piercing coldness swept across in a minute, with a velocity three or four times faster than that which had been before or after it; and if one happened to be in its track, the hands had to be instantly applied to the face to prevent frost-bite. The weather was very rarely, indeed, so violent as to preclude exercise in the open air; when it was so, the crews of both ships were marched round the deck of the "Lady Franklin," with the drum and fife at their head, which, with the assistance of a song occasionally, enabled us to spend two hours very agreeably. The drum was frequently used in the open air, when the men marched in a body; but the fife could not be used without danger of exposing the person who played it to frost-bite; and on this account it never enlivened the out-of-door marches.

January 13th. — The weather was every day be-

coming more pleasant, and the beautiful azure sky was generally without a cloud, except along the horizon over Barrow Straits, which yielded a constant supply of vapour to the thirsty atmosphere. Up to this time the temperature had not been sufficiently low to freeze mercury, but now it was down to $-39°$ by Pastorelli's spirit of wine thermometer, and the mercury was as solid as a leaden bullet. If a portion thus frozen was taken into the bare hand, it suddenly became fluid, and the part thus exposed to its powerful conducting property became frozen. We never felt the slightest inconvenience from the cold, and frost-bites were unheard of. This might have been owing to greater caution on the part of persons when exposed to low degrees of cold, than had been adopted early in the season, when the weather was much warmer, but at the same time sufficiently cold to produce frost-bite. The snow on the floe, and on the land, and everywhere, was very hard and resisting, so that a person might walk over extensive patches of it, without leaving a single impression of his shoes in it.

Preparations for travelling were commenced with vigour, and Captain Penny endeavoured to allot to each in the Expedition a due share of the work. With respect to cooking apparatus, our deficiency was insurmountable; for nothing relating to cooking

for travelling parties had been supplied to our Expedition. The ingenuity of our mechanics was taxed very severely; but it was gratifying to discover that the conjoint schemes of the blacksmith of the "Lady Franklin" and of the carpenter of the "Sophia" promised fair to make up the deficiency a little, although not to the extent that would make our travelling comfortable. Neither tents nor sledges were supplied; but the carpenters had already made two or three of the latter, which were in constant use taking ice from the land, and the former were cut and put into the hands of the sailmakers. We often had the quantity of ice weighed, which seven men dragged to the ships at one time on any one of the sledges, and it was generally found to exceed fifteen hundred pounds, exclusive of the weight of the sledge itself. The ice over which they had to pass with the laden sledges was smooth; and it appeared to offer little resistance, whatever weight had to be dragged along, provided that the proper form of runner was used. We often saw the broad runner shod with gutta percha in daily use, and certainly it was a great way behind the solid wooden runner shod with iron, and not more than an inch and a half in breadth.

It was found necessary to be particular with some of the crew who were not of active habits, for

indigestion was sometimes the result of indulgence in their usual allowance of food, accompanied by want of exercise during violent storms. The system of parading the crews of both vessels for two hours on the capacious deck of the "Lady Franklin," and marching them round and round, keeping step with the music of fife and drum, was found of essential service in preventing this evil. There was an exception to this, however, on Sundays. Lethargy during the day was exceedingly common; and it was not without a decided struggle, or engaging in some exciting duty at the time it came on, that one could successfully keep it off. It is very probable that it arose from too full living, and the absence of the light of the sun, one of the most essential stimuli of organic and animal life.

The temperature of the ships varied a little from time to time, according to the force and direction of the wind and its temperature. In the apartment occupied by the crew, fifteen in number, on board the "Sophia," where there was a fire generally burning, it was about $+50°$; but frequently it was below $+30°$. The beds there, and the chinks of the partition between it and the main deck, often produced large quantities of ice; but this never did any harm, for it always continued in that state. I often observed the temperature of the air which

rushed in at the lower part of the entrance of that place so low as −3°; while that at the top was +50°, rushing in an opposite direction; and about midway between the top and the bottom, within a space of four feet, that being the height of the entrance, there was a neutral point, in which the candle flame went neither out nor in, the lower part of it appearing to incline inward, while the upper inclined outward. In this there was a simple illustration of the phenomena of winds and typhoons, which rage across and devastate tropical countries. In the cabins of the "Sophia," and in the recesses, such as bed places, and lockers around them, the temperature frequently came down to +20° or +18°. This, however, was only in the parts "around" the cabins, where great quantities of ice accumulated; but in the two cabins it varied considerably. At the top it was often up to +70° or +80°, while at our feet +24° was common. Sitting on the sofa in the small cabin, where there was a fire generally, although not constantly, a thermometer at the height of a person's head was at +50°; at his feet it was +16°. From observing such differences, and knowing that there were still greater differences when the external air at −39° came into operation, we were very indifferent and careless about ventilation; for so long as the

fires were kept up, and the funnels carried away the smoke and the heated air, the air within the ship would undergo renewal with sufficient activity. The bedding was generally aired before the fires once a fortnight, but no part of it was permitted to be taken on deck or into the open air, because, on being re-introduced into the bed places, a deposition of vapour took place, which made it sensibly wet. Personal cleanliness was made stringent, and any deviation from it was never allowed to pass by unheeded. Clothes were sometimes washed in the galley, which, being in the fore part of the ship, did not send any vapour into other parts farther aft, being drawn off by means of a funnel which led up through the awning into the open air. Had the galley been in the middle of the ship, it would have been far less easy to prevent the spread of the vapour. The clothes which were washed there were never very clean, because they had to be dried in the fire-places, where there was generally a good deal of smoke or soot from the use of oil or candle for fifteen or eighteen hours out of the twenty-four.

The schools were always attended, and the "performances" continued to receive the support which the zeal of the actors really merited. A masquerade and a ball on the last night of December excited great attention, and afforded an unusual amount of

amusement to the crews of the three ships, among whom nothing but the most praiseworthy harmony always prevailed.

January 31*st.*—We were under the necessity of attending very closely to the funnels since the temperature became so low. The vapour resulting from the constant combustion of coal in the fire-places became frequently condensed at the top of the funnels; and, mixed with a quantity of sooty matter, it narrowed the passage through which the upward current had to pass, in consequence of which ventilation was rendered less active, and the temperature of the different apartments of the ship was raised in some instances twenty degrees above what we had been accustomed to.

Considerable difficulty was experienced with the tide line; interruptions in the register had taken place but seldom since the 1st of October, and we were quite sanguine that it would not be impossible to keep it going all winter. The saw was frequently got out, and the opening was enlarged considerably by removing a square portion of the solid ice all round it. The temperature of the water was always the same; or, if there was any difference, our ordinary instruments were not sufficiently nice in their graduation to detect it.

On the 25th and 26th there was a violent gale from N. and N. E., accompanied by a good deal of

snow, which drifted along the horizon with great violence. The barometer began to rise with a northerly wind twenty-four hours before the gale came on, and during the violence of the gale it rose from 29·80 to 30·07. At first the temperature was about −30°; in about eighteen hours it rose to −15°; and at the termination of the gale it fell to −23°, the wind being N. 22° W., N. 22° E. and N. respectively. On the 27th the gale abated; and as the floe was free from drift, there were inducements to make excursions over it to the land at the S.E. and S.W. points of the harbour, and also to the offing. On the return of the parties who had been thus distributed, open water to the extent of two or three miles in breadth was reported, stretching from E. to W. along the south shore of Cornwallis Island, and also in the direction of Griffith's Island. The whole pack in Barrow Straits had shifted over to the opposite side of the Straits, and hence such a large space of open water on this side. It was really beautiful to behold an extensive sheet of blue water on the 31st day of the cold month of January, in those dreary and icy regions, where we were led to believe that in the depths of winter everything would be firmly clasped under the powerful influence of intense cold.

The sky, during the hours of daylight, which

by this time were lengthening out very plainly, was frequently spread over with fleecy clouds; and at night the Aurora, of a beautiful golden colour, danced from E. to W. in vivid coruscations, and enlivened our midnight scenes, although, as has been remarked already, they were much less vivid than in more southern latitudes. The temperature varied with us much less than it did with Sir W. Edward Parry at Melville Island in 1820. The maximum was $-10°$ on the 10th, and during a southerly wind and an overcast sky, the minimum was $-41°$ on the 21st, during long continued northerly winds and very clear weather.

During the month of December, recently precipitated chloride of silver was exposed to the southern horizon, with the idea that its white colour might be changed to black, as there was always a little daylight present. It was also exposed to the moonlight at the same time. Frequent examinations were made for fourteen days before and after the 22nd; but there did not appear to be the slightest change from the original white colour. Towards the 1st of January it began to assume a very slight leaden tinge; and before this time, the 31st, it was considerably darker, although the change even now was not what half a minute's free exposure to the sun's rays would produce.

Water-cresses and mustard were reared with great

care, and they were very highly prized. Several stems were examined, and found to be four to five inches in length. The proportion of water which the young plants contained was so great, that one could hardly expect to derive great benefit from a few ounces of them every week. A portion was exposed to a temperature of +90° to +100°, until it ceased to lose weight by further exposure; the remainder, containing all the antiscorbutic and nutritious properties of the plant, amounted to 6·5 per cent., which was not nearly one half the weight of the seed that had been used: the 93·5 which escaped, unfortunately happened to be water. I tried the same experiment several times with both mustard and cress, so that I might, if possible, receive favorable impressions with respect to the gardening; but the results were invariably the same, for the water which escaped by evaporation often exceeded 93 per cent. I could hardly credit that a plant grown in the dark, and destitute of every trace of green, containing such a large proportion of water, and almost insipid with the exception of the acrid principles of the seed and its essential oil, could possess virtues worthy of the slightest confidence. The young plants were less acrid than the seed, and the essential oil had almost all disappeared; their weight, too, was about half the weight of the seeds which produced them.

Notwithstanding, its cultivation was encouraged and continued zealously, and the amusement and recreation it afforded proved of great value to those who devoted their attention to that department of horticulture.

Frost-bites were now a little more frequent, but never severe; and they always occurred as the result of carelessness. If a part became frost-bitten once, it ever after became more sensible of the cold and more liable to be frozen. We required to have candles burning on deck during the hours of daylight as well as at night; for the light from without was too faint to penetrate through the thick woollen awning which we always kept laced as closely as possible to the bulwarks.

During violent storms, when the drift was very thick, the snow sought its way through the numerous crevices about the lacing of the awning and the bulwarks. Large wreaths frequently accumulated on the deck, and required a good deal of toil to get rid of them as soon as there was an improvement in the weather. The condensation of vapour on the inside of the awning, and large accumulations of snow on its outside, had to be removed very frequently; indeed, these were standing duties which came every morning.

Our lime-juice, vinegar, porter, and ale became

frozen in the casks. The effect of this in each, was a separation between the essential and the watery parts; the former escaping into the centre of the cask, and the latter becoming frozen all round it. Portions of the lime-juice from the centre and the sides, dissolved separately, were found to be of specific gravity 1·0582 and 1·0114. It was evident that, to restore the mean specific gravity, we had but to mix the two in due proportions. The porter and ale had to be exposed to the temperature of the cabins for a considerable time, before any could be taken out of the casks, some of which were found to have rejected a portion of the essential part which remained fluid through the bung-hole, which the expansion in the process of congelation had forced open. Our carrots were found to be a little spongy, owing to the pressure to which they had been subjected, by being frozen in the tins. This, however, did not interfere, in the slightest degree, with their good qualities or agreeable taste. Our potatoes were beginning to be rather scarce; consequently, we could not afford the luxury of using them boiled, but we enjoyed the still greater luxury of a salad of them in a raw state.

February 7th.—The temperature of the between-decks, close by the mainmast, was −10°. This happened to be very near the chest where the

medicines were kept. With few exceptions, everything fluid in it was frozen quite hard; castor oil became as hard as horn, and contracted about one-twelfth of its volume; all the syrups and the various preparations were one mass of ice, and in some cases the bottles were found broken: the only loss that was sustained by this was that of the glass.

The weather was very changeable, and a good deal of snow was falling from time to time. Daylight was increasing perceptibly every day, and new attractions were always urging us into the open air. The amount of sooty carbonaceous matter, the result of the constant use of candles and oil, which was deposited on the ceiling of the cabins, bed-cabins, books, clothes, and everything that came in its way, was so great, that one could trace the direction of the currents of heated air, by the marks which it left while making its exit through the chinks of doors and various other outlets.

Some of the crew complained of bringing up very dark coloured mucus from their lungs with efforts of coughing. Their alarm at this was soon quieted, when they were told it was the soot they inhaled with every inspiration. This had been observed several times since the commencement of winter, but of late, as the weather had become much colder, and there were fewer and shorter excursions made in the open

air; and also, as most of the crew were devoting their spare hours to reading and repairing their clothes, it increased very much, and really did alarm some, until they made application on account of it. The funnels of the cabin fires were still found almost entirely closed up with condensed vapour and sooty matter at the top; and nothing was more common every morning than dirty stalactites of ice and soot, some of which were two feet long, pendent from the rim at the lower part of the chinks, where the smoke made its escape. There was no doubt it arose from condensation of vapour, the result of combustion; for it appeared in the greatest quantity during clear and the coldest weather, when the air must have been in a very dry state, and when there was no drifting snow.

Winter was now over; and although it may have been designated gloomy, I am sure there was none in our Expedition who could say that it had left impressions of gloom, or of anything disagreeable or repugnant to the feelings, that would tend to encourage any dislike to a repetition of it. But still, each, beholding the glorious sun bursting forth into view, and illuminating the southern sky, after an absence of ninety-five days, could not deny gratitude to Providence, by whose "Almighty and most gracious protection" he and his companions had been guided and preserved during winter, which, although neither

dreary nor long, yet did not merit to be placed in comparison with the enlivening beauties of advancing spring.

Although there were no cases of disease, nor ostensible signs which could possibly give rise to the idea that the health of a single individual in our Expedition had at all suffered, there were reasons for coming to the conclusion that there was a slight depression or want of tone, which would come in as the result of an Arctic winter. The ghastly paleness of features, which we had so often heard attributed to the absence of light, and which we were also told only came to be detected by the searching beams of the welcome sun, was scarcely discernible among us; with respect to this, however, each thought that his neighbour was a little affected, but it never occurred to him that the same might be doubly applicable to himself.

The man, whose middle finger had been found to be diseased, was in excellent health; but the affected part of his hand, which had assumed a healing aspect in November, became indolent in its action before midwinter; and by this time, although the appearance was nothing untoward, yet it was evidently not healing up, but rather disposed to stand still. It is hardly proper, however, to come to the conclusion that the health of the crews of both ships had suffered

from the effects of winter, because one person, with a trifling ulcer of the hand, did not continue to improve in health, as indicated by a healing process, until the return of spring.

There was a dense mist over Barrow Straits which obscured a full view of the sun; and had it not been for the constant evaporation which lodged on the southern horizon, and obscured it five days out of seven, we should have seen him a few days sooner.

CHAP. XV.

SHORT EXCURSIONS AND EXPERIMENTS.

Open Water reported in Barrow Straits. — Person lost his Way. — Snow-balling. — Great Anxiety. — Party from Griffith's Island. — An Arctic Winter only a Pastime. — Kate Austin Lake Salmon. — Party to Griffith's Island. — Minimum Temperature for the Season. — Theatricals. — Freezing of Sea Water. — Saline Efflorescence on the Ice. — Ice formed on Sea Water at low Temperatures. — Sea Salt in Snow. — Density of Snow. — Experiments on the Congelation of fresh and salt Water. — Moulding Character of Ice and Snow. — Burrows. — Snow a Non-Conductor of Sound. — Respirators. — "Vital Capacity." — Evaporation from Ice. — Parhelic Circles. — Travelling with Dogs. — Open Water. — Cloudy Weather and low Temperatures. — Return of our Party. — Scurvy still on board the "Felix." — Seals seen. — Dogs walking into the Water. — Preservation of the Eyes. — Two Seals shot. — Exposed Thermometer about Zero.

February 13th. — The weather for a few days, from the 8th to the 10th, was rather stormy, the wind prevailed chiefly from N. 22° W., and there was snowdrift occasionally, which annoyed us very much in our excursions on the ice and on the land. Several parties went to the S. E. point of the bay, and a few miles further to the eastward in the direction of Dungenness Point and Cape Hotham. On the return to the ships of almost every party of strollers, open water was reported in Barrow Straits, varying in

breadth from one hundred yards to two or three miles, and extending from E. to W. as far as the eye could reach in both directions, with hardly any interruptions. At Griffith's Island it was about two miles S. of the S. point of the island. It was impossible we could know that it reached so far as Griffith's Island, it being enough for us that it was lost sight of leading in that direction. Captains Penny and Stewart reported not less than five miles of open water, which they had seen on one of their frequent excursions. The temperature of the water was always the same, and the ice in the harbour was still increasing in thickness at a steady rate. Large wreaths of snow were often raised up during violent gales; and it was always observed that the accumulations of southerly, easterly, and westerly winds were invariably less dense and resisting than those of the northerly winds.

February 18th.—On the 15th, about the time of full and change, a violent gale came on from S.E., with the atmospheric pressure decreasing, and a high state of the thermometer. The sky was overcast, and the snow drifted constantly and with great violence; so that many times it was extremely dangerous to go into the open air to clear away the ice from the tide-line at the ship's stern, or to read off the thermometer. On the following day, at noon, the sun

looked out for a short time, and we thought there was to be a return to better weather. The wind veered a few points to the eastward, and continued to blow fiercely till the next morning. At an early hour, groups could be seen on the floe in all directions around the ships, no doubt congratulating each other on having got over such a violent storm. There was one person, however, on whom congratulations were heaped by every person in Assistance Bay. He happened to lose his way on Saturday evening, at the commencement of the storm, and having groped about for five or six hours, alighted on one of the ships, which turned out to be the one he had left. Exposure for six hours to a temperature not exceeding —17°, during a strong wind, told its tale in the appearance of his cheeks and nose, which had been severely frost-bitten, and had lost a great portion of the skin. Had he lain down on the floe, of course he must have perished, in which case the Felix would have lost one of her crew.

A great deal of levelling was necessary before the paths between the three ships were rendered passable. The men, when they turned out with their shovels, resembled a number of labourers turning out after a storm to clear away the snow from the roads. There was a little difference, however, between our blue jackets and road-men; for their work was often inter-

rupted by snow-balling, in which they seemed to take great delight. To behold so many strong, healthy, and hearty men thus enjoying themselves, was a source of inexpressible gratification to all who took an interest in their health.

For a day or two after the storm, the weather was very pleasant, the sky was generally very clear, and fleecy and stratified clouds were spread over it. There were halos around the moon during the night, and beautiful parhelic circles, rich in the four prismatic colours, around the sun during the day, which added a charm to every thing we beheld. Our mechanics were as busy as possible, preparing sledges and cooking vessels for travelling. Several conjurors—for that was the name by which a cooking apparatus was known —were made, and found to suit tolerably, although there would necessarily be a good deal of waste of fuel, owing to the freedom with which the heat escaped as it was generated in the "burner" within the conjuror, at the bottom of the vessel intended for the reception of snow to be melted into water, or of food requiring to be cooked.

Early in the afternoon a person, in a state of breathlessness and great anxiety, arrived on board the "Lady Franklin." He had been detached from a party belonging to the ships under Captain Austin's command, which was on its way to Assistance Bay.

The party consisted of several men and two officers; and the reason for the sudden appearance of one of the latter was, that one of his friends had been seized with cramps in his stomach, the result of the free use of snow to quench his thirst, which ended in something described as a "fit." The assistance, which seemed to be so much required from Assistance Bay, was speedily and efficiently granted. The dogs were soon harnessed to their sledge, and Mr. Petersen set out with them at full gallop. The sun was on the S. W. horizon at the time; and as his bright beams fell upon the ice and the white snow, forming an illuminated path, which the dogs had to keep for a part of their journey, the vapour as it escaped from their lungs by rapid and panting expirations became condensed, and, mixing with the fine snow raised by their feet and by the sledge as it was dragged along, they resembled griffins making their way through the clouds with their chariot, and vomiting liquid fire. Half the crews of both ships set out to meet the party; such was their desire to render help if it should be required. At 4 P.M. the whole party arrived in perfect safety, the man having recovered his spasms soon after the messenger to our ships had departed. Mr. Bradford, surgeon of H. M. S. "Resolute," and Mr. Hamilton, mate of H. M. S. "Assistance," were the officers of the party.

It was very gratifying to us to learn that our friends at Griffith's Island had come through the winter in good health and spirits. The feelings which appeared to have taken possession of every one I met were certainly very amusing. Nothing could be heard but expressions of astonishment at the shortness and cheerfulness of the winter; and our kind and most welcome visitors seemed to vie with us in making it appear as a mere pastime, and the opposite of what each had anticipated in an Arctic winter. These expressions were a sufficient proof that the winter had not failed to leave its impressions on our minds, or to do its work on our constitutions, and that it had been felt, too, although we had a desire to conceal our true feelings from others as well as from ourselves, lest we should lose confidence in ourselves, or betray a cowardly feeling in speaking of the winter with chilling recollections, or in dressing it up in its real winter garb. Let those have the credit who deserve it, for our good health and happiness during winter; and, with these blessings, let us ever associate the victuallers of our Expeditions, Hogarth, Cooper, Edwards; and the clothiers and boot-makers, Brown, Kilby, and others whose names I do not know; and also our respective commanders, who deeply interested themselves in everything that would conduce to the good of all under their charge.

February 19th. — Before and after noon there was a beautiful parhelic circle, rich in the prismatic tints, around the sun. The weather was very clear, and, with the exception of the vapour in Barrow Straits, which was never absent, there was hardly a cloud upon the sky. Several of us went on an excursion to Kate Austin Lake. The ice on it was six or seven feet thick; and its upper surface was rendered irregular, and contained numerous fissures, which extended to a depth of one or two feet. The irregularities on it varied from one to three inches. It appeared very strange how the surface, which had been left level and as smooth as glass in September, should now be thrown from its level, and, in some parts a little roughened, when there was no disturbing cause, so far as we knew. The ice was perforated in one or two places, and lines were put down to take some salmon. Several scores were seen, but only two small creatures were obtained. Their movements in the water were very slowly performed, and, from looking at them at a depth of two fathoms, an idea was obtained that they were in rather a torpid state. I examined the viscera of the two that came into our hands. The maw was quite empty, and the whole of the viscera was infested with *Nematodean entozoa*, which nestled in coils beneath the serous investing membrane. Each nidus contained a quantity of thick

viscid fluid, which, before it was laid open, gave it the appearance of a yellow vesicle sunk in the tissue which supported it.

February 24th.—The weather was remarkably fine, there was little or no wind, and the temperature was —41°. The mercury, which we always kept exposed in a broken tumbler, had been frozen for nearly three successive days. Freely exposed to the sun's rays, the thermometer generally rose 10° above the shade, if the weather was clear. This day, at 3 P.M., it was —29°, while the other was —39°. The party belonging to the squadron at Griffith's Island, accompanied by Captain Stewart, Mr. Goodsir, Mr. Stuart, and seven seamen, left Assistance Bay to proceed to Griffith's Island. Mr. Petersen also went with them with the dog-sledge, to make sure of their safe arrival at their destination, and to drive over some bears' flesh, which had been kindly preserved, by the command of Captain Austin, for the use of our dogs. Several bears had been seen and shot at Griffith's Island during winter, but not one in or near Assistance Bay. It is very probable that the dogs which prowled about and so frequently raised fearful howlings were the cause why bears did not pay their visits to us, as well as to the other ships. The weather continued very fine throughout the day; and, although the temperature was always about

—41°, we expected our friends would be able to accomplish their journey in safety. The distance was about twenty miles; rather long, I fear, to be safely performed, when the thermometer indicates 77° below the freezing point of water, it being at —45° before midnight.

February 26th.—Scarcely a day passed but we had the sky adorned with mock suns and halos; it was always very clear and cloudless, except over Barrow Straits, in which open water could still be found, at a distance of two or three miles from the ships in the harbour. In the evening Mr. Petersen returned from Griffith's Island, bringing in the "mails," as his package of letters was generally called. Our party arrived safely at the ships, but they were very much exhausted, having suffered severely from thirst, frost-bites, and fatigue; the frost-bites did not extend deeper than the skin, the thirst and fatigue were soon recovered from, but the impression which the combined effects of the three had made would not soon be effaced; and a conviction arose from it, or seemed to arise from it, that there was great danger in travelling during such low temperatures as they had experienced.

February 27th.—A party of ten persons, under the command of Commander Phillips, left the "Felix" for Griffith's Island, chiefly for the sake of

the exercise their limbs should have in accomplishing such a long journey, and partly that they might be present at a grand fête, the last performances for the season, which, if the splendidly embellished printed play-bills, that were flying about in all directions, be true, ought really to vie with the Italian Opera, Drury Lane, or the Lyceum. The whole dramatic and singing force of the squadron was to be thrown into one exquisitely grand entertainment, which was to come off on the 28th, to commemorate the commissioning of the Expedition, after which, work in right good earnest was to take the place of amusement, and nothing was to be permitted but duty, the one and all absorbing duty of preparing for travelling. It will astonish our hard-working friends at home, who have no confidence in sudden evolutions of character, who insist upon the fact that long continued training is necessary, and indeed, essential, before the human will can assume a relatively new phase, to learn that Captain Austin's squadron underwent its metamorphosis in one night; that it closed its eyes and went to sleep with the deafening roars of noisy festivity dinning in its ears; and awoke next morning to follow the beckonings of humanity, to devote itself wholly and solely to most important duties, in spite of the frowns of Zero. Was this owing to the limits which had been set to

pleasant and amusing recreations, before they were begun, or was it merely the result of reaction? If it was the former, great wisdom was displayed in putting pleasure, "fickle jade," under arrest, before she began to lose her charms,—in allowing her to retire clothed in her chaste and queenly attire, throwing a bright effulgence on the pale faces of her votaries, who were just merging into the dazzling brilliancy of "Spring," from the gloomy depths of Polar night. If it was the latter, great passiveness and want of elasticity of mind, as well as want of firmness of purpose, marked in a peculiar manner those who heedlessly threw themselves into such a dangerous stream,—a stream which they ought to have known would soon carry them beyond their depth, a stream every day becoming more brackish, and poisoning the air with a noxious effluvium, the result of a true analysis of its elementary ingredients.

The weather was very favourable for the excursion, but great fears were entertained by Sir John Ross that the temperature should come down suddenly at night, before his men could arrive at their destination.

During this month the winds prevailed generally from the north; Aurora Borealis was very common, but not vivid; storms were of short duration, and the weather was for the most part very clear. The maximum temperature for the month was $-10°$, after

a south-easterly wind had prevailed for two or three days; and the minimum was −45° during clear and almost perfectly calm weather.

One of the fire-holes about four feet square, which had been opened between the "Lady Franklin" and the "Sophia," was permitted to freeze over for forty-five hours, during which time the temperature of the air was rarely above −40°, and not below −45°. The ice which formed in that time was ten inches thick; and its upper surface was very rough, and covered with a fine white powder, in the form of tufts resembling miniature molehills, planted so closely together, that, at the base, each came in contact with its neighbours on every side. A portion of this efflorescence, as it may be called, was collected very carefully, and permitted to dissolve, which it did very readily in the temperature of our cabin; and at +37° its specific gravity was 1·088, which showed that it contained four or six times as much salt as sea water. The rapidity with which congelation of the surface water had taken place, prevented the descent of the particles of saline matter, rendered dense by refrigeration; and as the watery particles necessarily became frozen, and expanded, the saline particles were thrown to the surface, by the pressure which the process of expansion caused, and appeared in the form already noticed. The ice formed under those circumstances is invariably

rough, and it very soon thaws as the temperature increases. Travelling over it is not accomplished without great labour even on foot; and it is much worse with sledges, for the friction is increased very much; and if dogs are driven over it, they are seized with spasms, which often prove fatal to any young ones that may be among them. Mr. Petersen says, that, on the eastern shores of Davis Straits, they avoid driving over floes formed at low temperatures, for the reason that it destroys their sledges and their dogs, more especially young dogs. He thinks the cramps are owing to the dampness to which the dogs' feet are exposed at low temperatures, the warmth of their feet dissolving the particles of saline matter on the surface.

Up to this time we were very much at a loss to understand a fact, frequently observed by Baron Wrangell, "crystals of sea salt deposited on the surface of the ice. To attribute what that distinguished traveller had observed to evaporation even in the slightest degree, appears strange, when it has been proposed to have barriers of ice removed by sprinkling sea salt over its surface. As he observes that the sledges became rough, and the dogs suffered, when ice with salt on it had to be crossed, there seems to be little doubt but it was exactly the same thing that we had observed, and had proved to be

owing, not to evaporation of sea water from the surface of the ice leaving the saline matter, but to rapid congelation of the surface of the sea itself.*

A portion of the solid ice, formed at a temperature not above −40° nor below −45°, yielded water of density 1·0113. Another portion of the same ice, exposed to a temperature of +36° to +44° for twenty-four hours, so placed that the water containing its saline ingredients could percolate through it and away from it as soon as it melted, produced a residuum of ice which yielded, when it was dissolved, water of specific gravity 1·00052, which might be used for cooking purposes with perfect impunity. There could not be a better proof of the power which temperature from +30° downwards exercises over the saline ingredients of water. The presence of this highly saline efflorescence on the surface of ice formed on the surface of open water during low temperatures, which would include the greatest part of winter and spring, accounted for the invariable and abundant indications of chlorides and sulphates found in water obtained by dissolving snow from wreaths on the floe, and also on the land, even at a distance of several miles from the sea-coast. I

* Wrangell's Siberia and Polar Sea; by Lieut.-Col. Edward Sabine, R. A., F. R. S., 2d edit. p. 134.

took a cube of snow, which contained eighteen cubic inches, from one of the wreaths that had been raised during a strong south-east wind on the 15th and 16th, when the temperature varied from $-30°$ to $-10°$, and found that the water which was produced by melting it amounted to 6·0197 cubic inches at $+62°$. By a simple calculation, the density of the snow was found to be ·3344, or a little more than one-third the density of ice. On applying the tests for chlorides and sulphates, the chief saline ingredients of sea-water, it was evident that they were present, and in great abundance, considering that the water had been obtained by melting snow, which is generally understood to resemble rain water with respect to softness and freedom from saline matter. Another cube of the January deposition, from wreaths upwards of half a mile inland, containing forty-five cubic inches of snow, produced 11·5 fluid ounces, 19·895 cubic inches of water. By the same method as before, the density proved to be ·44. Thus, water being 1000,

$$\frac{19{\cdot}895 \times 1000}{45} = {\cdot}44.$$

Tests for chlorides and sulphates proved the presence of both these bases as abundantly as before. The snow of density ·33 was very soft and unresisting; and it is very probable a strong north wind

would remove it, unless a very low temperature occurred soon after it fell. That of density ·44 was very hard and resisting; walking over it left no impressions of the shoes, and a heavily laden sledge moved along it with great facility, and did not sink one-eighth of an inch. There can be no doubt that the source of the abundant indications of sea-salt in the snow-water, is the salt particles which the freezing process at low temperatures presses to the surface, whence it is liable to be drifted away by the wind. On one occasion we had to use snow instead of ice for cooking purposes, owing to bad weather, and our stock of ice from the lakes having run out unexpectedly. The water prepared from the snow did not admit of the most distant comparison with that prepared from ice, and a great deal more fuel was necessary to dissolve the former. This was owing to the greater amount of air which the snow contained.

A strong iron bottle of a capacity to contain 2337 minims of water at $+40°$, was exposed full of water to a temperature of $-17°$. In a few minutes a little of the water began to escape at the orifice of the bottle, which was about half an inch in diameter; but after congelation commenced, which was in a few minutes, the escape of water ceased, and a column of ice could be seen ascending slowly through the

orifice, moulded exactly to its shape, and emitting a crepitating sound, which was interrupted by a loud explosive report, accompanied by the sudden rejection of the ascending column, as if it had been fired out of a pistol; the height which it had attained was eighteen lines, and it was found that expansion had taken place by congelation in a ratio of ·1028, making the entire volume now 1102 instead of 1000, which it was in a fluid state. After thawing the ice in the bottle, it was found deficient 213 minims, which reduced the original quantity from 2337 to 2124. If 1000 be taken as the specific gravity of water, then $\frac{2124 \times 1000}{2337} = ·9088$ the specific gravity of ice. This gives ice below ·92, which has been generally looked upon as its specific gravity; the difference ·012, however, is but trifling, and it may be accounted for by the contractile property of the metal of which the bottle is made.

After removing the bottle from the low temperature, and having placed it in a vessel containing water a few degrees above the freezing point, I observed that the ice in the orifice ascended at least one-twelfth of the height of the former column, which had been removed, and it did not begin to recede until a crust of ice, which had formed on the outside of the bottle, had fallen off, and the ice

within had evidently begun to dissolve. In this experiment there was a tolerable proof that ice follows the same laws of contraction and expansion by cold and heat as other substances, and as correctly as I could estimate it, it appeared to be in a ratio of ·00016 for every degree of the thermometer.

The temperature of the air being −43°, barometer 30·03, and the weather calm, the iron bottle full of water was exposed, and in half an hour a portion of ice began to escape at the orifice, with crepitation and explosive reports, which ceased after two hours. The ice that escaped had the exact shape of the orifice, but it was friable and presented a few transverse fissures or cracks, which rendered it very easily separable into sections or fragments. After introducing it into a temperature of +33° or +34°, a column of ice three-fourths of a line in height was pressed through the orifice, and when the whole was reduced to water there was found to be a deficiency of 216 minims, very nearly in the same ratio as before. The expansion, however, which followed the increase of temperature from −43° to +32° was at variance with the results of the former experiment, for, three-fourths of a line instead of one and a half, and seventy-five degrees of the thermometer instead of fifty, gave a ratio of ·00005

for every degree of the thermometer, instead of ·00016. This discrepancy does not alter the main feature, that there is a decided contraction produced by still lower degrees of cold upon ice. The same bottle was exposed full of water to + 18°, and the amount of water which the freezing process displaced was found to be 240 minims, which gave a ratio of ·114, or an increase in volume to 1114 instead of 1000. The column of ice protruded through the orifice was very firm and free from cracks, requiring an effort before it could be broken off, and in its growth or ascent the crepitation was so faint that it could hardly be detected by placing the ear close to it. Sea water of density 1·0244 at + 44°, exposed to a temperature of − 14°, in the iron bottle, began to freeze after two hours' exposure, and a column of very porous ice rose to a height of five lines; thirty-two hours' further exposure increased its height but one line, and after transferring it to − 29°, a briny fluid oozed through the ice in the orifice, and ran down the sides of the bottle. At a temperature of + 49° the deficiency amounted to 204 minims, and its density was reduced to 1·0114. The density of the ice was estimated by calculation to be ·912, and its ratio of expansion ·0965.

These experiments were interesting at the time, because they filled up hours which might have hung

listlessly on our hands, and moreover they tended to bear upon the important and interesting subject of the descent of glaciers, which the untiring labours of Professor Forbes have placed upon a sure basis. By their assistance we could easily understand the cause of the fissures in the surface of the ice on Kate Austin Lake, and the irregularities of its once smooth and glassy surface. We also had very clear proofs of, to use the words of Sir Charles Lyell, the moulding and self-adapting power of ice under pressure, as if it were a pasty substance, even at very low temperatures; but we could not agree with respect to friability, for it was invariably observed that this property increased as the temperature decreased.* The crepitating sound itself conveys the idea of friability at low temperatures; and with respect to the same condition, the sudden rejection of a portion, with an explosive report, is most satisfactory. The parapets of our gangway, which were built up of square blocks of very dense snow, began to yield soon after they were finished, early in November, and notwithstanding the low temperature throughout the winter, they continued to yield, without falling, until the upper part became overhanging, and was at right angles with the portion on which it rested. The

* Sir Charles Lyell's Principles of Geology, 7th edit., p. 226.

same yielding property of snow was still better seen in the curves which the transverse arms of a cross assumed. They continued to be deflected, until the extremities of the horizontal portion had each performed a curve of 90°, without presenting the slightest trace of a fissure.

Captain Penny suggested the idea of ascertaining what amount of warmth and comfort could be attained in a close burrow in the snow. In November a single individual raised the temperature of one from —4°, that of the air at the time, to +20° in about twenty minutes; but the heat of the snow and the ice must have been much greater then than it was at this time. Two burrows, each six and a half feet long and two and a half feet wide, were excavated about six inches above the level of the blue ice, in a wreath which had accumulated during an easterly gale. There was a thickness of at least four feet above each, from the surface of the snow downwards; and the entrances into both were made so as to shut very closely. A thermometer enclosed in one of them for four hours rose to —2°, the temperature of the external air at the time being —29°. Two persons, the capacities of whose lungs were represented by 240 and 210, were enclosed in them for an hour and a quarter; at the end of which time the temperature had risen from —28°, that of

the air, to $+3°$ and $-3°$ respectively; the person with the most capacious lungs raising it seven degrees higher than the other. To say the most of the burrows, they were not warm; and closed up in them as the two persons were, an idea of being buried alive was continually uppermost in their minds. However, there is no doubt, had our circumstances demanded it, but we should have overcome this idea, and have appreciated the comforts of burrowing in preference to sleeping in the open air.

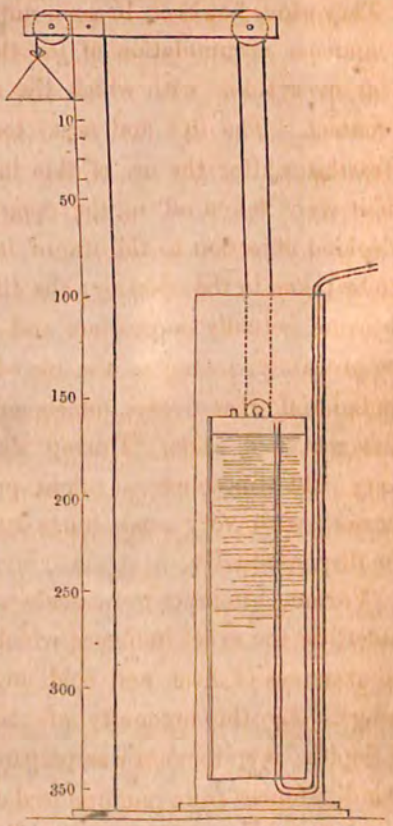
While enclosed in the burrows, the two persons kept up a conversation through the partition of dense snow that intervened between them. They had to bawl loudly to one another, although the thickness of the partition did not exceed a foot. And when they were spoken to through the doorway, which was securely closed also with firm snow, one had to call out in quite a stentorian voice before a reply could be obtained. The thickness of the slab of snow which closed the doorway was not above nine inches. This is at once a proof of the bad conductor of sound we have in snow. It is very probable that the property of conducting sound diminishes with the density from ice down to the softest snow.

Respirators were used on several occasions, and they afforded great relief from a constriction which was often felt across the chest when one rushed into

the open air at $-43°$ out of the cabins at $+60°$. They soon, however, became unpopular, owing to the immense accumulation of ice that always appeared on everything with which the expired air came in contact. The lips and nose, too, became liable to frostbites after the use of this instrument, especially if it were taken off in the open air. There was a decided objection to the use of it when exercise had to be taken in the open air; the difficulty of breathing became actually oppressive, and perspiration flowed so profusely, owing to the over-heated state of the individual, that every inducement to persist in its use was laid aside. During sleep, however, in a very cold atmosphere, it might prove useful, and, to persons with very weak lungs its use could hardly be dispensed with.

Various attempts were made with a spirometer to ascertain the exact influence which sudden exposures to extremes of heat and cold might have upon the lungs. By the ingenuity of the carpenter of the "Sophia" a spirometer was prepared, which indicated the differences from one hundred and eighty to three hundred and twenty cubic inches with the utmost precision, although it went considerably beyond these extremes. It was always observed, that violent exercise in the open air at low temperatures, reduced the quantity of respired air very considerably. A

very common degree of diminution was one-seventeenth; but it was often much below this. Two healthy persons, whose capacities two hundred and sixty and two hundred and fifty-five cubic inches will represent, were engaged in gymnastics on the floe, in which they had to run and vociferate until perspiration began to appear. The temperature was −30°, and there was very little wind. After two hours' exposure the one was reduced to two hundred and forty-five, and the other to two hundred and forty. A person who expired two hundred and five cubic inches with great ease, was exposed to air at +98° in the dis-



SPIROMETER used on board H. M. S. "Sophia," made from a description given in the "Lancet," vol. i. 1850.

charge of a duty which involved the voice to a considerable extent. Immediately after the duty was over, a powerful expiration amounted only to one hundred and ninety.

When a quiet walk was taken over the ice at any temperature, there was very little reduction, and there was still less by the use of a respirator, if the exercise was not such as to induce perspiration. On one occasion an alarm was given that a bear was to be seen at the offing, and a great many persons went in pursuit of it as fast as they could run. The alarm proved to be false; but, before the mistake was discovered, some of them had brought on violent anhelation and severe pains and constriction across their chests, accompanied by a short tickling cough and expectoration of a thin watery fluid. The amount of air received into their lungs, under those circumstances, must have been considerably reduced: its quantity was not ascertained, however, from a precaution which I adopted for fear of any mischief occurring by causing any effort to fill the lungs when they were already suffering from over-exertion. The rapid abstraction of moisture and heat from the soft and extensive mucous lining of the lungs could not fail to bring on very great congestion, of which the symptoms complained of were the results.

While the temperature in the shade was generally about −40°, the entrances into the two burrows were closed up for a few days, at the end of which time a spirit of wine thermometer was introduced and allowed to remain inside, with the entrance closed up as before. After four hours the instrument indicated −2°; so that the idea was laid aside which had been entertained previously, that it was the heat of the persons who had remained shut in for upwards of an hour, which had caused the increase of temperature we had noticed in the close burrows. The roof of each appeared to be planted over with little rounded masses of snow which followed the arch from side to side, but did not descend the sides any distance. There is no doubt this was owing to evaporation. Several casks had been allowed to stand on the floe during a great part of winter. Some of them wanted ends and were inverted, while others had both ends in, but the lower end invariably never touched the snow except at the rim, which projected two or three inches beyond the end or bottom. The interiors of the casks were beautifully adorned with magnificent crystals, which sparkled like diamonds and gems, when we first saw them, as the casks were turned over and exposed to the sun.

The following are the most common forms that

were observed; in each the minute features are nearly analogous.

It may appear strange that evaporation should go on from the surface of ice or snow cooled so far below the temperature at which liquefaction takes place. The extreme dryness of the air, however, reconciled us at once to the fact. Two pieces of wood, oak and fir, each measuring two cubic inches, were carefully dressed and squared by the carpenter, and after being dried at a temperature of $+90°$ or 100°, their weights were ascertained, and carefully noted. They were then put into a vessel with water at a temperature of $+40°$, until perfect saturation took place, and having again weighed them, they were immediately exposed to a temperature far below the freezing point, sometimes to the extent of 60° to 70°, where they were allowed to remain for two or three months, after which they were weighed; the deficiency which was found showed clearly that even from a frozen surface a supply of vapour is not denied to the dry and thirsty atmosphere above and around it. The experiment was repeated several times with different

pieces of wood, but the results in all were nearly exactly the same.

February 28th.—At an early hour this morning the sky became overcast, and the wind, which was northerly, veered to the eastward a few points. The temperature, which the previous night had been down to −43°, rose at first to −37°; but at this temperature the mercury in the tumbler did not thaw, owing probably to the thickness of the glass, and its non-conducting property. Very soon after 3 A.M. the temperature rose above −37°, and then the mercury thawed, having begun to soften first on the upper surface. Yesterday, in the evening, there were most beautiful parhelic circles, of the richest prismatic tints, on the western sky. They were present during the greater part of the day, but, as evening approached, nothing that I had ever seen of the same kind equalled them. Their radii were 22° 47′ and 45°, and they were disposed vertically and horizontally to the sun. The exposed thermometer, at right angles with the rays, rose to −3°, while in the shade it was −34°. At noon to-day the wind had increased to a strong gale from E.N.E., and there was a constant whirling about of immense volumes of drifting snow. Towards evening the snow, still thickening in the wind, became a little squally, the squalls resembling those already alluded to, both with respect to coldness and

violence. Captain Penny made a promise to Sir John Ross to let him have the dogs and sledge, accompanied by Mr. Petersen, to drive him over to Griffith's Island, that he might be present at a general meeting of the officers of the squadron under the command of Captain Austin, in which they were to consider fully the preparations for travelling, and the time for starting. Sir John wished to impress them with the importance of not leaving their ships before the second week in May, for before that time they might expect lower temperatures than $-25°$, at which he says human blood freezes. He was exceedingly reluctant to give up all expectations of accomplishing the journey, even after the snow had become so thick that we could hardly see the one ship from the other, at a distance of one hundred yards.

Mr. Petersen had no doubt our young dogs would be able to perform a great amount of work along with the old, if we could but get meat for them on the ice as we went along. Travelling with dogs on the eastern shores of Davis Straits is rendered easy by the shortness of their stages, from the proximity of the settlements. If, however, a journey has to be performed beyond the settlements, the ice presents as much food as their dogs can use, in the way of bears and seals,

which they shoot as they go along. If Barrow Straits should present the same facilities, Mr. Petersen often said that he could make the northwest passage with them with the greatest ease. The dogs, young and old, seemed to have a great attachment to us. Every morning, the moment they discovered that one of us had gone into the open air, they all came out of their kennel and crowded round us, looking for nothing but caresses, which were often lavishly bestowed. If more attention was paid to one than to another, the individual thus favoured was generally attacked by some of the others, and its enjoyment was very generally short-lived among its jealous neighbours. Owing to this some of the young ones had so learned by habit to avoid our attention, that they would run away the moment we attempted to caress them. They were divided into two packs, and each pack had its master, who attended to their training, under the superintendence of Mr. Petersen. While undergoing their training one could often see a small dog-sledge flying over the ice with a waft streaming from a short pole bearing some motto, which had been rudely inscribed by the driver with the burned end of a stick. If a party of the seamen happened to meet one of their own number thus exercising the dogs, they generally hailed him in the words "What ship is that, and whither bound?"

to which they hardly had time to receive the reply—"the packet for Melville Island and Behring Straits with the mails"—when he shot past and was out of hearing.

March 4th.—The weather was very stormy for a few days: there was much snow, and the wind prevailed chiefly from north-west. The thermometer kept rather high, having been up to −9° on the 2nd, the highest temperature noted in the shade this season.

We could hardly expect our parties to have returned from Griffith's Island previous to this time, owing to the bad weather; but now, as it was beginning to improve, they might be looked for daily. Our preparations for travelling were making rapid progress in the hands of the mechanics; but they found that a host of articles inconceivably numerous and small would be required. Daily exercise in the open air became imperative, and each seemed to vie with his neighbour who could endure the cold best, and be distinguished as a good and enduring traveller. After the work of the day was got over, a party of strollers went in the direction of the south-east point of the harbour in the evening before sunset, and, on their return on board, they reported that they had seen open water extending east and west along Cornwallis Island, which varied in breadth

from one to two or three miles. They said it contained a quantity of bay-ice, which was every moment breaking up and overlapping, as the tide was bringing in the loose pack at the offing. One of them was confident he had seen a seal in it; but his neighbours were equally positive it was only a piece of ice turning over that had deceived him.

March 6th.—The bad weather of yesterday precluded the idea that our parties would be able to return. They might have pushed on on the previous day, and I suppose would have done so had the morning promised good weather. There was no doubt of their safety so long as they remained on board the other ships; but on their way to Assistance Bay some of them might break down, and be in great danger of suffering themselves, and of knocking up the whole party. Owing to those fears we kept a close watch on the southwest point of the Bay, where the first appearances of their return should be discovered. At noon, the sun's rays received on the ball of the thermometer were only $-23°$, while the shade was $-28°$. This was owing to the presence of a considerable amount of clouds or vapour, which prevented the admission of the rays to the earth's surface. It was frequently observed that now cloudy weather was no objection to a low state of the thermometer; on the contrary, it seemed to be favourable to it, for the

earth's surface, including snow, ice land, &c., had been cooled down to such a degree, that, in cloudy weather, there was no heat to radiate from it, and the sun's rays being excluded, a stratum of air lay along the surface, and partook of the intense cold which could be so easily spared. Ice and snow conduct heat very slowly. If a piece of fresh-water ice be plunged into water after it has been exposed to a temperature of $-20°$ to $-30°$, it flies to pieces, in the same way as red hot glass does when plunged into water; and, if water be poured upon ice, the same thing happens, and the crepitating sound is almost loud enough to resemble small explosions.

At 3 P.M. our party from Griffith's Island was espied on its return on the south-west point, and in a short time all our companions were safe on board. One or two, however, had suffered from frost-bite; but it was chiefly confined to the skin, and would soon heal up. They were all very much fatigued, and thought the journey quite long enough under such circumstances. Very favourable reports were brought from the squadron at Griffith's Island, both verbally and by letters: the latter were chiefly confined to the commanders, although even some of our seamen had correspondents in the other squadron. Preparations for travelling were said to have commenced in good earnest, and great stir seemed to take

up the attention of all in that quarter. It was finally arranged that the Wellington Channel should be searched by our expedition, while Captain Austin's was to do all the rest; and the "Felix" was left in the background, because it was not believed that she possessed the means to accomplish anything with safety or satisfaction. It was exceedingly gratifying to see her crew all able to attend to their duties There was one person, however, of whom scurvy had taken a severe hold: all that could be done for him proved of little value, since the supplies of preserved vegetables and other antiscorbutics, which had been granted by Captain Penny, were discontinued by the request of Sir John Ross, who said that, now as his crew was quite well, he desired not to continue a burden to our expedition. He was still forced to receive supplies of sugar, for that is an article which persons possessing a slight scorbutic taint will not want for a very short time without the disease shewing itself vigorously, unless vegetable diet be substituted for salt-beef, a measure which could not be adopted on board the "Felix" in Assistance Bay.

March 7th. — Mr. Petersen went out with his rifle to the edge of the open water beyond the south-east point of the bay. The loose ice in Barrow Straits sometimes narrowed the water very much; but this drifting about had a good effect in clearing

away the young ice which formed rapidly on the surface. To most of us it appeared to be the chief cause or means by which a space of water should have been kept open for so long a period, and at such low temperatures. A seal was seen in the water, but at too great a distance for Mr. Petersen's rifle. When this was reported on board, we expected that seals would be found upon the ice towards the end of spring or the commencement of summer, which might enable us to support our dogs on travelling parties for an indefinite length of time. Some of the young dogs accompanied one or two of the men to the water; and having never seen water before that time, one of them walked into it with the utmost coolness and indifference, and was almost drowned. The same thing happened to several of them; but by little and little, experience taught them that a distinction was necessary to be made between ice and water.

March 8th.—The sky was very clear, and perfectly cloudless, and there was very little wind: it increased, however, from the northward towards evening. The rays raised the thermometer to $-2°$ from $-35°$, at which it happened to be in the shade. The intense light, reflected into the eyes from the white snow, produced great congestion, owing to which one would have to grope about for a quarter

of an hour after coming below into the dark cabins. It was ludicrous to see a person come into the cabin, and, after staring at everything before him, take his seat without observing any person, although three or four might be present. It not unfrequently happened that a person in this state came stumbling upon his invisible companions, who generally endeavoured to retain their laughter, until some such accident was the signal for a general outbreak.

There was much said and schemed about and for the preservation of the eyes. Various glasses were in great requisition among some; others used green veils, which the foresight of the government had supplied; and a third party used goggles, made of wood or gutta percha. Each person had his idea, and he considered himself entitled to maintain it, because his experience bore him out in doing so. Perhaps all in their several opinions were more or less correct; but it was certain that the human eye protected, as it might or might not be, by veils, green or black, single or double, neutral tint or no tint, was sure to suffer, when the individual had to attend closely to duties in the open air, exposed to the white snow during intensely bright sunshine, for an undue length of time; and it was equally certain that the cause of that most painful disease—snow-blindness —would require to be removed before one could

recover from it. There were generally two conditions of the atmosphere which tended to produce this disease:—when the sky was cloudless, and the pure rays were reflected into the eyes from the snow, and when it was overcast with a misty haze, which obscured the azure tint altogether, and sometimes might be quite blood and of a bluish white appearance; while at other times it did not obscure the sun altogether, but seemed rather to render the light from it doubly intense. The first of these was the least hurtful, and a black screen proved a very useful protection from it: the other, however, seemed to defy everything: but the most useful we found was black crape in the form of veils, which could be made single or double, according to the amount of protection which one desired. Neutral tint preserves suited very well, but only second to the black crape: this is what one might expect; for it is not the quality of the light so much as its quantity that has to be altered; and it leads me to observations already made on snow-blindness, in which the Esquimaux mode of preserving the eyes is recommended, substituting wire gauze, which is nearly the same as crape for goggles, and putting it into the form of spectacles with side shades. When the sky is overcast, the light transmitted to the eye through an accumulation of watery particles, in a state of ice, must undergo

some change besides mere refraction—perhaps partial polarization, which exerts a most pernicious influence over the eyes. When parhelia and parhelic circles are present, which are caused by process of double refraction or polarization, there o danger of snow-blindness occurring. It is w' n the atmosphere appears to be pervaded with co aled vapour, in a state of "confusion," that the g atest caution must be used to prevent it, and then the use of coloured glasses may be had recourse to, but only second to the wire gauze.

Mr. Petersen and one or two of the men went out to the water to shoot seals, if by good chance they should happen to come sufficiently near. They had not been long on the out-look, un'l two appeared and were shot, the one after the othe'; and, fortunately enough, they did not sink. This is different from what we were familiar with in L vis Straits and the Wellington Channel last summer and autumn; and it proves what Mr. Petersen had often told us, that seals fattened during winter. Halkett's boat was taken to the water, and inflated and launched into it; the temperature of the air at the time was $-30°$, the mean for that day being $-33°$, $65°$ below the freezing point of water. Mr. Leiper one of the mates of the "Lady Franklin," got into the boat and picked up one of the seals, but, unfortunately

the other was drawn underneath the ice by the tide, which had began to return before they were shot. The dogs soon drove the seal to the ships; but by that time it was frozen as hard as animal tissues could be with such intense cold. It belonged to the species of common seal (*Phoca vitulina*), which winters in Davis Straits and the adjoining seas, breathing through holes in the ice, which it keeps open during winter, after it has become one continuous sheet from shore to shore. It is very probable that this seal has holes in the ice, independent of open water, for we often saw it lying upon floes, along the east shore of Davis Straits at holes which it must have kept open during winter and spring, where the ice was in a loose state all the season. Its stomach was examined, and found to contain the remains of fish in great abundance; and from the entire state of the skeletons, there was [redacted] recognising the genus to which the Whiting belongs (*Merlangus*), which is so widely diffused in the Polar Seas. The stomach presented deep perforations into the mucous and cellular coats, in which whole bundles of *Nematoid* entozoa could be seen sticking, like what has been already compared to the tentacles of the sea anemone. The dogs were very glad of such delicious morsels as the entire seal-skin and bones afforded, for they had been a considerable time without rich animal food.

March 9th.—The weather was every day becoming clear and more pleasant, although the cold was generally intense. Last night the mercury became frozen, and continued in that state for nearly twelve hours. The lowest temperature that was observed was −36°; probably the circumstance that the same quantity of mercury having been frozen frequently on previous occasions may account for the readiness with which it now assumed the solid form. It was to be regretted that we had not a self-registering thermometer; for it is not unlikely that the temperature was two or three degrees lower than had been read off: in this case, the mercury would have become solid at once, by the escape of heat, and the thickness of the glass-tumbler would for a considerable time retain the cold. At noon the shade was −30°, and the exposed instrument was −2°; at 1 P.M. the shade was −31°, and the exposed +2°. This was the greatest difference that had hitherto been observed between the shaded and exposed instruments; and it was also the first time that the thermometer had been above zero this season, even in the sun's rays. On the surface of the floe, where there were gentle slopes to the southward, the surface of the snow had become a little glazed, from a very thin film of the snow melting, and again freezing almost instantly. It did not appear to have

begun to thaw on the land, or even against the black paint of the ship's side: from this fact we could hardly question the correctness of the indications of the exposed thermometer, although at the same time it was extremely difficult to account for the glazed appearance of the snow already noticed, an appearance which at once conveyed an idea that the temperature had been above the freezing point of water.

END OF THE FIRST VOLUME.

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